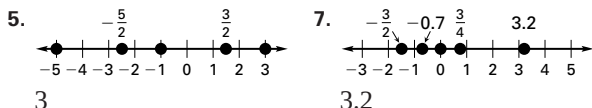


Selected Answers

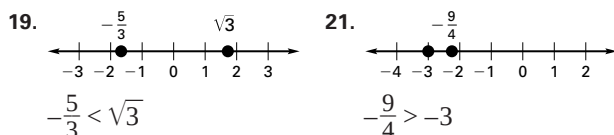
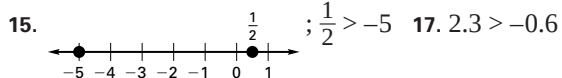
CHAPTER 1

SKILL REVIEW (p. 2) 1. 11 2. -70 3. 8 4. 9 5. 24 6. -7
7. -10 8. -8 9. 60 units² 10. 121 units² 11. 165 units²
12. 20.25π units², or about 63.6 units²

1.1 PRACTICE (pp. 7–10)



9. inverse property of addition 11. commutative property of multiplication 13. inverse property of multiplication



23. $\sqrt{5} > 2$ 25. $\sqrt{8} > 2.5$ 27. -6, -3, $-\frac{1}{2}$, 2, $\frac{13}{4}$



31. $-\sqrt{12}, -\frac{12}{5}, -1.5, 0, 0.3$ 33. inverse property of addition

35. commutative property of multiplication 37. identity property of multiplication 39. Yes; the associative property of addition is true for all real numbers a , b , and c .

41. Yes; the associative property of multiplication is true for all real numbers a , b , and c . 43. $32 + (-7) = 25$

45. $-5 - 8 = -13$ 47. $9 \cdot (-4) = -36$ 49. $-5 \div \left(-\frac{1}{2}\right) = 10$

51. 13 ft 53. \$612.50 55. Honolulu, HI; New Orleans, LA; Jackson, MS; Seattle-Tacoma, WA; Norfolk, VA; Atlanta, GA; Detroit, MI; Milwaukee, WI; Albany, NY; Helena, MT; three 57. Yes; the result of performing the given operations is 9, the check digit. 59. Sky Central Plaza: 352 yd, 12,672 in., 0.2 mi; Petronas Tower I: about 494.3 yd, 17,796 in., about 0.2809 mi 61. yes 63. \$214 65. -15°F

1.1 MIXED REVIEW (p. 10)

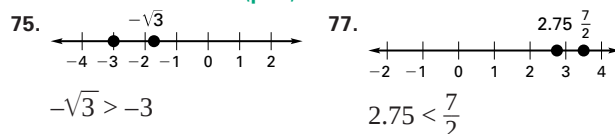
69. 63 71. -30 73. 19
75. -34 77. $x - 3$ 79. $\frac{1}{4}x$ 81. 10.5 in.^2 83. 750 in.^2

1.2 PRACTICE (pp. 14–16)

7. 5 9. 27 11. $9x + 9y$
13. $8x^2 - 8x$ 15. 8^3 17. 5^n 19. 256 21. -32 23. 125
25. 256 27. 24 29. 19 31. 0 33. -5 35. 125 37. -8
39. 76 41. $\frac{9}{5}$ 43. $-\frac{5}{13}$ 45. 16 47. $6x^2 - 28x$ 49. $16n - 88$
51. $-5x - y$ 53. $\frac{1}{2}n(n + 10)$; 1000 55. $(x + y)^2$; 289

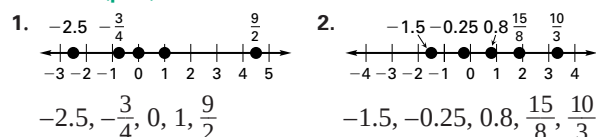
57. about 1,200,000; about 238,000 59. $149 + 3.85(12)n$, where n is the number of movies rented each month; \$426.20 61. $[4n + 8(3 - n)]15$, or $360 - 60n$, where n is the number of hours spent walking; \$240

1.2 MIXED REVIEW (p. 17)



79. inverse property of addition 81. identity property of multiplication 83. $\frac{8}{7}$ 85. $-\frac{4}{5}$ 87. -9 89. $-\frac{1}{14}$

QUIZ 1 (p. 17)



3. distributive property 4. associative property of addition

5. 15 6. $-\frac{17}{3}$ 7. -14 8. 76 9. -124 10. $8x - 11y + 4$

11. $2x - 10$ 12. $-2x^2 + 5x - 6$ 13. $-2x^2 + 14x$

14. $0.35n + 13.95(15 - n)$, or $209.25 - 13.60n$, where n is the number of regular floppy disks bought

TECHNOLOGY ACTIVITY 1.2 (p. 18)

1. $(-4)^2 - 5$; 11
3. $(1 + 4)^6$; 15,625 5. 4.32 7. 160.989 9. 7.833
11. 5912.099 13. 0.81

1.3 PRACTICE (pp. 22–24)

7. 5 9. 5 11. $\frac{5}{4}$ 13. -3 15. 28
17. Subtract 5 from each side. 19. Multiply each side by $-\frac{7}{4}$. 21. Subtract 2 from each side; then multiply each side by 3. 23. 5 25. $\frac{7}{2}$ 27. $\frac{4}{5}$ 29. -1 31. 0 33. 4 35. $\frac{85}{12}$
37. 3.2 39. 7.5 41. length: 36, width: 14 43. -78.5°C
45. 5 h 47. \$635,000 49. 16.25 ft

1.3 MIXED REVIEW (p. 24)

57. $25\pi \text{ in.}^2$, or about 78.5 in.^2
59. $49\pi \text{ in.}^2$, or about 154 in.^2 61. 8 63. 21 65. 11
67. -28 69. $21 - 5x$ 71. $7x - 6$ 73. $x + 35$ 75. $3x^2 - x + 11$
77. $4x^2 + 16x$

TECHNOLOGY ACTIVITY 1.3 (p. 25)

1. False; $y_1 = y_2$ when $x = -2$, not when $x = 2$. 3. -2 5. 1 7. 1

1.4 PRACTICE (pp. 29–32)

5. $y = \frac{5}{3}x - 3$ 7. $y = -\frac{3}{20}x + 4$
9. $y = \frac{4}{3}x - 24$ 11. 20 in. 13. -1 15. $\frac{16}{9}$ 17. $\frac{35}{3}$ 19. 1
21. -4 23. $\frac{11}{2}$ 25. $h = \frac{3V}{\pi r^2}$ 27. $P = \frac{I}{rt}$ 29. $b_2 = \frac{2A}{h} - b_1$
31. $h = \frac{S - 2\pi r^2}{2\pi r}$; $\frac{35 - 6\pi}{2\pi}$, or about 2.57 in. 33. $L = \frac{T}{m} + 21$

35. $W \approx \frac{TR^2}{R^2 + A^2}$ 37. $R = p_1V + p_2C$ 39. Sample answer:

210 sun visors, 550 baseball caps; 490 sun visors, 430 baseball caps; 700 sun visors, 340 baseball caps

41. a. $A = \frac{\sqrt{3}}{4}b^2$ b. $A = \frac{\sqrt{3}}{3}h^2$

1.4 MIXED REVIEW (p. 32) 47. $30 - x$ 49. $250 + x$ 51. $2x$

53. 8736 h 55. $4\frac{3}{8}L$ 57. \$165 59. -6 61. 4 63. -7

65. 40 67. 3

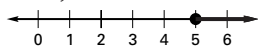
1.5 PRACTICE (pp. 37–39) 3. The diagram helps you see how to express the numbers of gallons used in town in terms of x , the label given to the number of gallons used on the highway. 5. water pressure = 2184 (lb/ft²); pressure per ft of depth = 62.4 (lb/ft² per ft); depth = d (ft) 7. 35 ft 9. $547 = 32t$ 11. about 17 h 13. $80t = (180)(3)$ 15. total calories = (calories/gram of fat)(number of grams of fat) + (calories/gram of protein)(number of grams of protein) + (calories/gram of carbohydrate)(number of grams of carbohydrate) 17. 4.1 g 19. Great Britain: 22.4 km, France: 15.5 km; Dec. 1, 1990 21. \$1.68 per page 23. length: 135 ft, width: 105 ft 25. 4.5 m 27. 4 bounces

1.5 MIXED REVIEW (p. 39) 31. true 33. false 35. -55, -10, -5, -1, 4 37. -2.9, -2.1, -1.2, 2, 2.09 39. 2 41. $\frac{4}{7}$

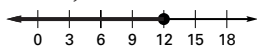
QUIZ 2 (p. 40) 1. 4 2. -8 3. $\frac{17}{3}$ 4. 160 5. $y = -\frac{3}{5}x + \frac{9}{5}; \frac{3}{5}$ 6. $y = \frac{4}{3}x - \frac{14}{3}; -2$ 7. $d_1 = \frac{2A}{d_2}$ 8. 49 boxes

1.6 PRACTICE (pp. 45–47)

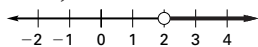
5. $x \geq 5$;



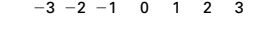
7. $x \leq 12$;



9. $x > 2$;

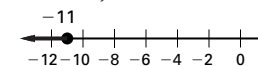


11.

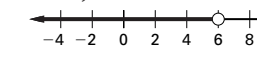


13. C 15. D 17. F 19. no 21. no 23. yes 25. $x > 5$

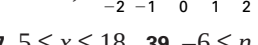
27. $x \leq -11$;



29. $x < 6$;

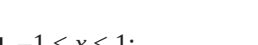


31. $x > 3$;

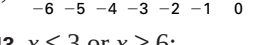


33. $x < 6$ 35. $x < 0$

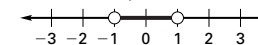
37. $5 \leq x \leq 18$



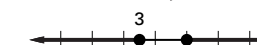
39. $-6 \leq n \leq -1$;



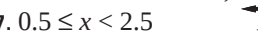
41. $-1 < x < 1$;



43. $x \leq 3$ or $x \geq 6$;



45. $x < -5$ or $x > -0.52$;



47. $0.5 \leq x < 2.5$



49. Your sales must be greater than or equal to \$5000.

51. Her score must be between 93 and 100, inclusive.

53. $184 \leq K \leq 242$ 55. $c > 2.83$

1.6 MIXED REVIEW (p. 47) 61. associative property of multiplication 63. commutative property of addition

65. $-\frac{10}{7}$ 67. -1 69. $1\frac{1}{5}$ h, or 1 h 12 min

TECHNOLOGY ACTIVITY 1.6 (p. 48) 1. $x \leq 4$ 3. $x > 3$

5. $x \leq -6$ 7. $x < 2$ 9. $x < 6$ 11. $x \leq 9$ 13. $x < -7$

1.7 PRACTICE (pp. 53–55) 5. yes 7. no 9. no

11. $11 - 2x \leq -13$ or $11 - 2x \geq 13$ 13. $-9 \leq x + 5 \leq 9$

15. $-18 < \frac{1}{4}x + 10 < 18$ 17. $x - 8 = 11$ or $x - 8 = -11$

19. $6n + 1 = \frac{1}{2}$ or $6n + 1 = -\frac{1}{2}$ 21. $2x + 1 = 5$ or $2x + 1 = -5$

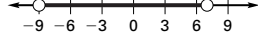
23. $15 - 2x = 8$ or $15 - 2x = -8$ 25. $\frac{2}{3}x - 9 = 18$ or

$\frac{2}{3}x - 9 = -18$ 27. no 29. no 31. yes 33. 2, 3 35. 6, -1

37. $\frac{26}{7}, \frac{34}{7}$ 39. 12, -18 41. $-15 \leq 3 + 4x \leq 15$

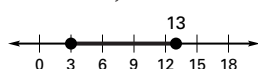
43. $-7 < 3x + 2 < 7$ 45. $-18 \leq 8 - 3n \leq 18$

47. $-9 < x < 7$;

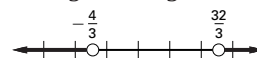


49. $x \leq 6$ or $x \geq 26$

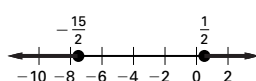
51. $3 \leq x \leq 13$;



53. $x < -\frac{4}{3}$ or $x > \frac{32}{3}$;



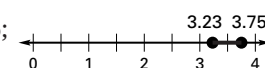
55. $x \leq -\frac{15}{2}$ or $x \geq \frac{1}{2}$;



57. $-4 < x < \frac{18}{7}$ 59. $-4 < x < 2$

61. $x < -3$ or $x > 7$ 63. $x < 1$ or $x > 4$

65. $|p - 3.49| \leq 0.26$;



67. $|x - p| \leq \frac{3}{16}$; between $8\frac{15}{16}$ in. and $9\frac{5}{16}$ in., inclusive.

69. $|t - 98.6| \leq 1$ 71. 393.6 oz; 374.4 oz; $|c - 384| \leq 9.6$

73. volleyball: $|v - 270| > 10$, basketball: $|b - 625| > 25$,

water polo: $|w - 425| > 25$, lacrosse: $|l - 145.5| > 3.5$,

football: $|f - 14.5| > 0.5$ 75. 2 L: $|c - 2000| > 9$,

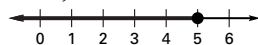
1 L: $|c - 1000| > 5$, 500 mL: $|c - 500| > 2$

1.7 MIXED REVIEW (p. 56) 91. False; if $x = -7$, then $2x = 2(-7) = -14$, not 14. 93. 21 95. -27 97. -14 99. 10

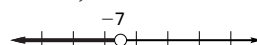
101. $x > \frac{1}{3}$ 103. $x \geq -5$ 105. $-14 < x < -2$

QUIZ 3 (p. 56)

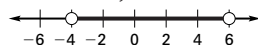
1. $x \leq 5$;



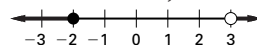
2. $x < -7$;



3. $-4 < x < 6$;

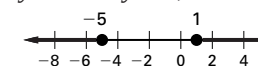


4. $x \leq -2$ or $x > 3$;

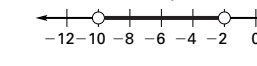


5. -1, -9 6. 5, 1 7. -3, 15 8. $5, -\frac{3}{2}$ 9. $\frac{16}{3}, -8$ 10. 1, 9

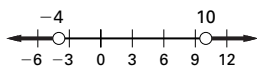
11. $y \leq -5$ or $y \geq 1$;



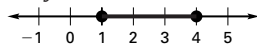
12. $-10 < x < -2$;



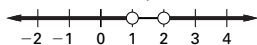
13. $x < -4$ or $x > 10$;



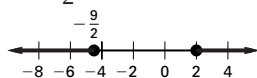
14. $1 \leq y \leq 4$;



15. $x < 1$ or $x > 2$;



16. $x \leq -\frac{9}{2}$ or $x \geq 2$;



17. $20 \leq e \leq 28$; between 320 mi and 448 mi, inclusive

18. $|d - 30| \leq 0.045$; between 29.955 mm and 30.045 mm, inclusive

CHAPTER 1 REVIEW (pp. 58–60)

1. $-\pi, -\sqrt{6}, -2, 0.2, \frac{6}{5}$; $-\pi, -\sqrt{6}, -2, 0.2, \frac{6}{5}$

3. distributive property 5. -18 7. 4 9. $5x + 4y$

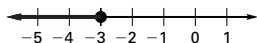
11. $11x^2 - x$ 13. -3 15. -32 17. 4 19. $y = 5x - 10$

21. $y = -0.2x + 7$ 23. $y = \frac{5}{6}x + 2$ 25. $l = \frac{P - 2w}{2}$

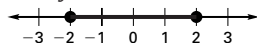
27. about 5 h 55 min 29. $x > 8$;



31. $x \leq -3$;



33. $-2 \leq y \leq 2$;



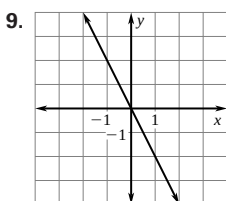
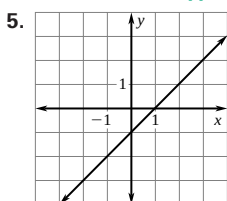
35. -5, 3 37. $-\frac{8}{3}, 6$ 39. $-2 < x < 7$

CHAPTER 2

SKILL REVIEW (p. 66) 1. 2 2. 2 3. 3 4. $y = -3x + 4$

5. $y = \frac{1}{2}x - 5$ 6. $y = -\frac{5}{6}x - 10$ 7. $x < \frac{9}{2}$ 8. $y \geq -26$ 9. $x < \frac{5}{2}$

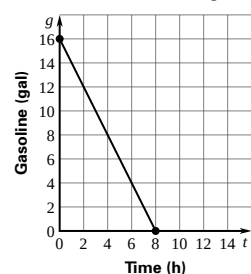
2.1 PRACTICE (pp. 71–74)



11. 3 13. 9 15. 1

17. domain: $0 \leq t \leq 8$; range: $0 \leq g \leq 16$;

Gasoline Remaining

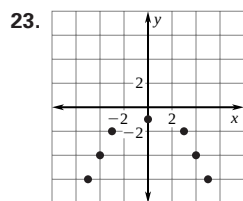


19. domain: -1, 2, 5, 6;

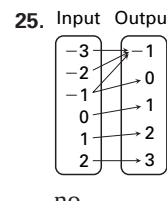
range: -2, 3

21. domain: 1, 2, 3, 4;

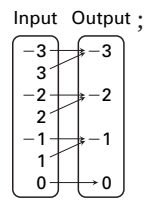
range: 1, 2, 3, 4



yes

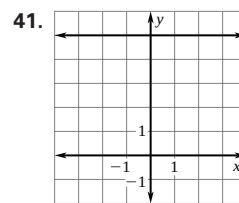
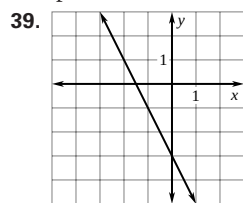


no



yes

29. If a relation is a function, then no vertical line intersects the graph of the relation at more than one point. If no vertical line intersects the graph of a relation at more than one point, then the relation is a function. 31. yes



43. linear; -7 45. not linear; 1 47. not linear; -25

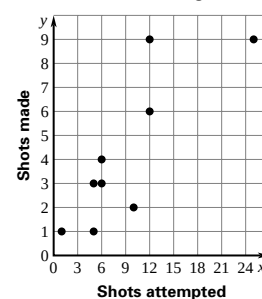
49. 125; the volume of a cube with sides of length 5 units

51. No. *Sample answer:* Not every age corresponds to exactly one place. For example, there were 24-year-olds with finishes of first and third.

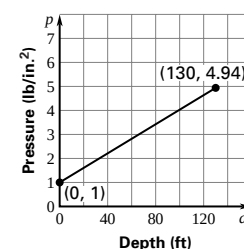
53. domain: 1, 5, 6, 10, 12, 25; 55. domain: $0 \leq d \leq 130$; range: 1, 2, 3, 4, 6, 9;

range: $1 \leq p \leq 4\frac{31}{33}$;

Jazz Shooting

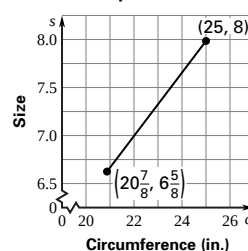


Pressure Versus Depth



57. domain: $20\frac{7}{8} \leq c \leq 25$; range: $6\frac{5}{8} \leq s \leq 8$;

Cap Size



2.1 MIXED REVIEW (p. 74) 65. 1 67. $\frac{1}{2}$ 69. $\frac{1}{4}$ 71. -7.5

73. $-4\frac{11}{16}$ 75. $-\frac{12}{11}$ 77. yes 79. yes 81. yes

2.2 PRACTICE (pp. 79–81) 5. undefined; vertical 7. -1; falls

9. 2; rises 11. line 2 13. neither 15. parallel 17. 1

19. undefined 21. 10; rises 23. $\frac{1}{2}$; rises 25. -1; falls

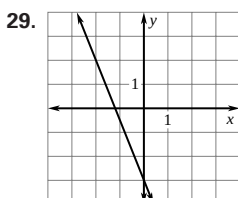
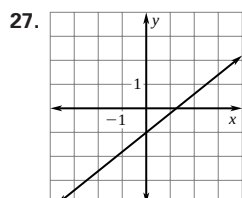
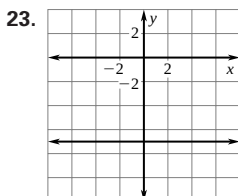
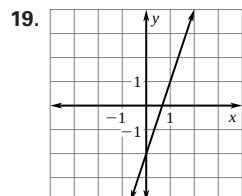
27. undefined; vertical 29. $-\frac{1}{2}$; falls 31. undefined;

vertical 33. C 35. A 37. line 1 39. line 2 41. parallel

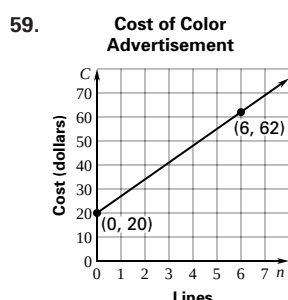
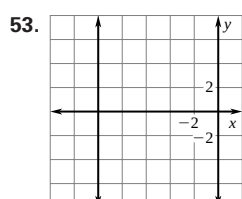
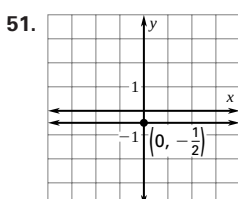
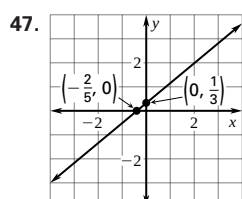
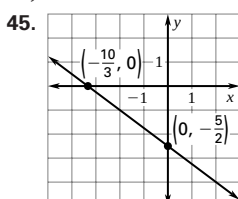
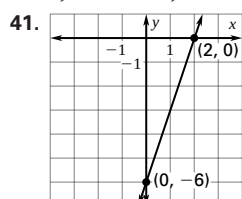
43. perpendicular 45. 6; dollars/h 47. 3; in./year 49. 10.75
51. 0.062 ft/year; this is the ratio of the number of vertical
feet the volcano must grow to the length of time it will
take to grow that high.

2.2 MIXED REVIEW (p. 81) 59. additive inverse property
61. distributive property 63. $15 - 8x$ 65. $8 - \frac{4}{3}x$ 67. $-8, -1$
69. $-1, \frac{5}{3}$ 71. about \$.45/oz

2.3 PRACTICE (pp. 86–88) 5. $-2; -7$ 7. x -intercept: 11;
 y -intercept: -11 9. x -intercept: 3; y -intercept: -15 17. A

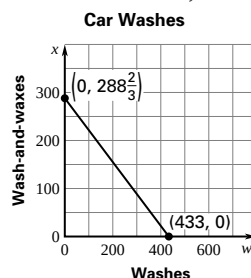


31. 6; 10 33. 0; 100 35. 4; -7 37. B 39. A

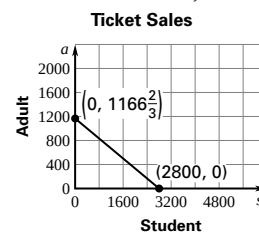


The slope, 7, represents the price of each line in the ad, while the intercept, 20, represents the initial cost of placing a colored ad.

61. $8w + 12x = 3464$



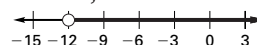
63. $2.5s + 6a = 7000$



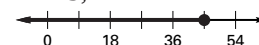
Sample answer:
1600 student tickets,
500 adult; 880 student,
800 adult; 400 student,
1000 adult

2.3 MIXED REVIEW (p. 88)

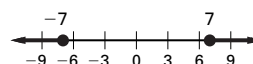
69. $x > -12$;



71. $x \leq 45$;

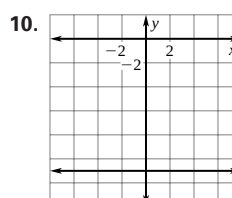
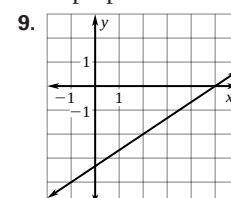
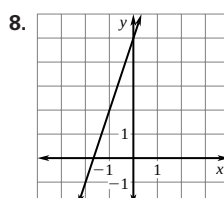


73. $x \leq -7$ or $x \geq 7$;



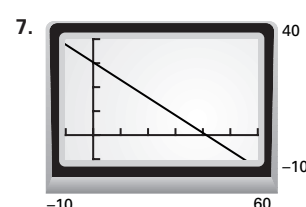
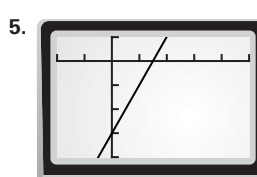
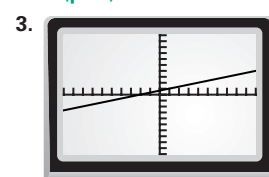
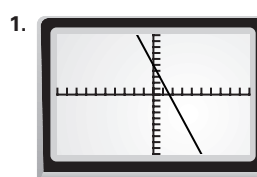
75. 12 77. 8 79. -16 81. $-\frac{6}{7}$ 83. undefined 85. -2

QUIZ 1 (p. 89) 1. domain: $-2, -1, 0, 1, 2$; range: $-2, 1$;
function 2. domain: $1, 2, 3, 4$; range: $1, 2, 3, 4$; not a
function 3. domain: $-3, -1, 0, 1, 2$; range: $-3, -2, 0, 1$;
function 4. -21 5. 139 6. perpendicular 7. neither



11. about 8.36 mi/h

TECHNOLOGY ACTIVITY 2.3 (p. 90)



2.4 PRACTICE (pp. 95–98) 5. $y = 2x - 4$ 7. $y = -\frac{3}{4}x - \frac{21}{4}$

9. $y = \frac{2}{5}x + 2$ 11. $y = 5x - 6$ 13. $y = 5x - 3$ 15. $y = -4x$

17. $y = \frac{3}{5}x + 6$ 19. $y = 2x + 4$ 21. $y = 5$ 23. $y = -\frac{4}{3}x + 2$

25. $y = 2x - 3$ 27. $x = 2$ 29. $y = \frac{3}{2}x - \frac{1}{2}$ 31. $y = -\frac{1}{2}x - \frac{15}{2}$

33. $y = -x + 8$ 35. $y = 3x - 19$ 37. $y = -\frac{7}{8}x + 1$

39. $y = x + 10$ 41. $3 = -\frac{1}{2}(2) + b$; $3 = -1 + b$; $b = 4$. The equation is $y = -\frac{1}{2}x + 4$, the same as in Example 2. The slope-intercept equation of a line is unique. 43. $y = \frac{7}{2}x$; 28

45. $y = -3x$; -24 47. $y = \frac{1}{2}x$; 4 49. $y = \frac{1}{2}x$; -10

51. $y = \frac{1}{5}x$; -25 53. $y = \frac{1}{2}x$; -10 55. yes; $y = \frac{1}{2}x$

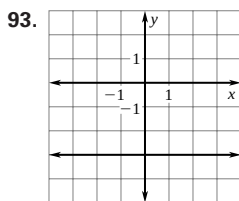
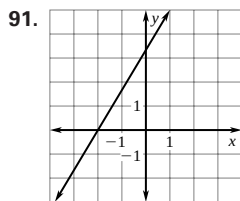
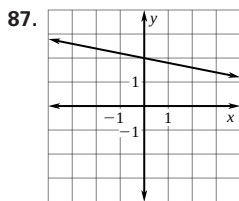
57. yes; $y = -x$ 59. $P = 60,300t + 2,842,200$; 4,289,400

61. $s = 0.629t + 7.4$; about \$21.2 billion 63. $h = \frac{1}{7}l$; 38.5 ft

65. $r = \frac{1}{240}t$; 11 min 67. no

2.4 MIXED REVIEW (p. 98) 71. -7, 27 73. -10, -8

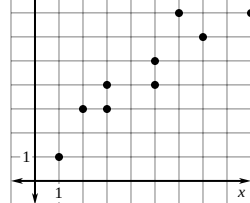
75. $-\frac{38}{55}, \frac{8}{55}$ 77. 14 79. 2 81. 0 83. -2 85. 1



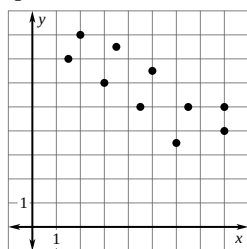
2.5 PRACTICE (pp. 103–105) 5. about 1.4 m

7. Sample answer: about 8830 9. positive correlation

11. ; 13.



positive correlation

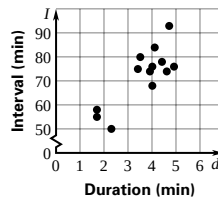


negative correlation

15. Sample answer: List the data points so that the values of x are in increasing order. If the y -values mostly increase along with the x -values, there is a positive correlation. If the y -values mostly decrease as the x -values increase, there is a negative correlation. Otherwise, there is relatively no correlation. 17. Sample answer: $y = -0.86x - 0.05$

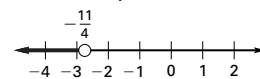
19. ; Sample answer:
 $y = -1.11x + 2.27$
21. Sample answer:
 $y = -0.73x + 2.47$

23. Old Faithful Eruptions ; positive correlation
25. about 2290
27. about 84.3 years

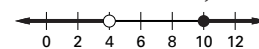


2.5 MIXED REVIEW (p. 106)

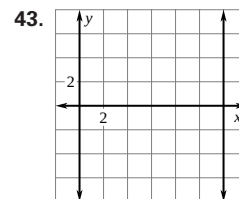
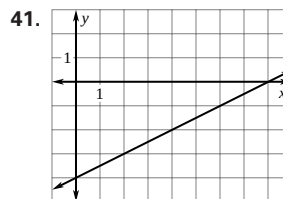
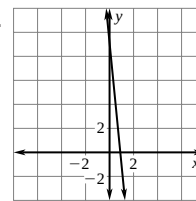
31. $x < -\frac{11}{4}$;



33. $x < 4$ or $x \geq 10$;



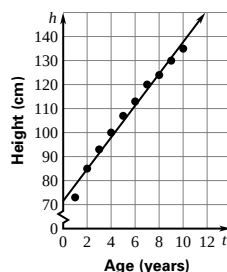
35. line 2 37. line 1 39.



QUIZ 2 (p. 106) 1. $y = \frac{2}{3}x + 6$ 2. $y = 2x + 5$ 3. $y = -\frac{1}{5}x - \frac{33}{5}$

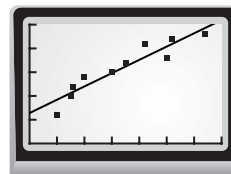
4. $y = 2x - 4$ 5. relatively no correlation 6. negative correlation 7. positive correlation 8. $d = 1.3h$; 4 ft

9. Heights of Children ; Sample answer: $h = 6.63t + 71.5$

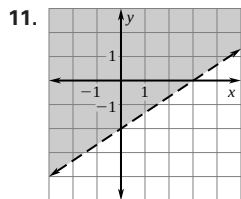
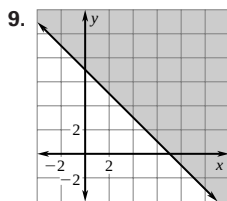
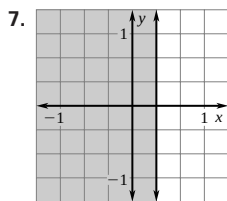


TECHNOLOGY ACTIVITY 2.5 (p. 107)

1. $y = 0.0028x + 0.32$;

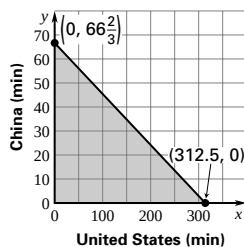


2.6 PRACTICE (pp. 111–113)



13. $0.16x + 0.75y \leq 50$;

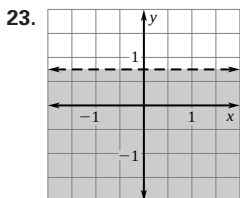
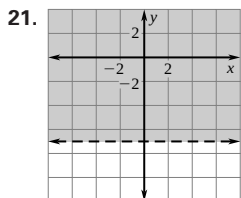
Calls for \$50



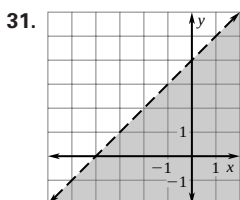
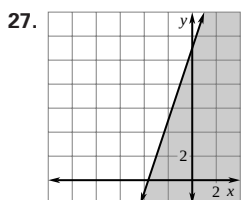
; One possible solution is to spend 50 min on calls to China and 78 min on calls in the United States, for a total cost of \$49.98. Another solution would be to spend 50 min on calls within the United States and 56 min on calls to China; this uses exactly \$50. A third

solution is 100 min on calls within the United States and 45 min on calls to China. This solution uses a total of \$49.75.

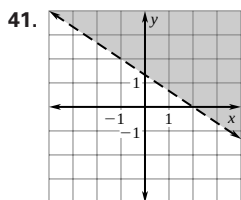
15. no; yes 17. yes; no



25. C

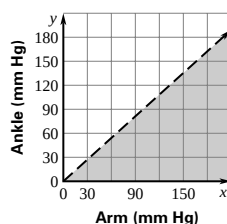


33. C
35. B



45. $y < 0.9x$;

Blood Pressure Readings

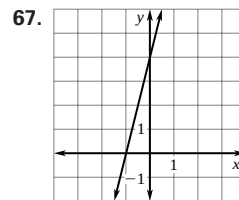
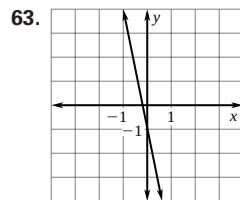


47. about 1.77 cups 49. *Sample answer:* You can attend 5 matinees and no evening showings for a total of \$22.50, 2 of each for a total cost of \$24, or 3 evening showings at a cost of \$22.50.

51. *Sample answer:* 9 touchdowns and no field goals for 63 points; 5 touchdowns and 1 field goal for 38 points; 2 touchdowns and 3 field goals for 23 points; 3 touchdowns and 3 field goals for 30 points; 4 touchdowns and 6 field goals for 46 points

2.6 MIXED REVIEW (p. 113)

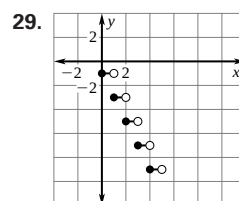
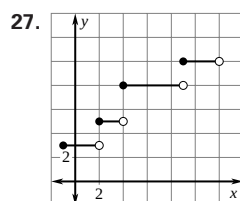
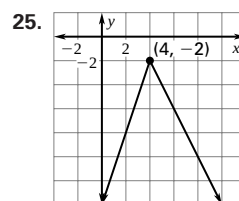
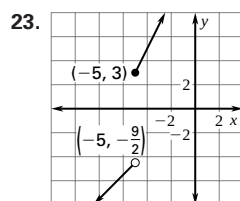
57. 1.65×10^9 59. 6.7×10^{-4} 61. 8.08×10^{-2}



69. $y = -\frac{6}{5}x + 7$ 71. $x = 3$ 73. $y = -8$

2.7 PRACTICE (pp. 117–120)

5. 27 7. 11
11. $f(x) = -\frac{4}{3}x + 6$, if $0 \leq x < 3$, $f(x) = -\frac{2}{5}x + \frac{16}{5}$, if $3 \leq x \leq 8$ 13. -21 15. -9 17. -9.5 19. -7

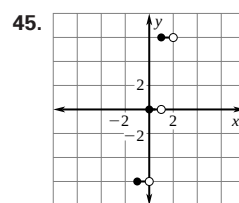
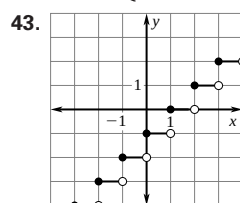


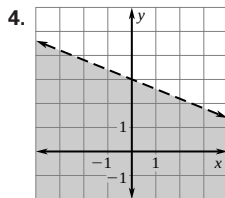
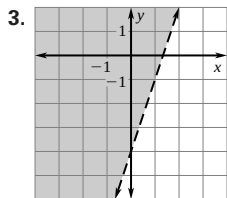
31. ; *Sample answer:* The function graphs each x-value to the smallest integer that is not less than it, giving a sort of upper limit to the x-values in each interval.

35. $f(x) = \begin{cases} x, & \text{if } x < 0 \text{ (or } x \leq 0) \\ 2x, & \text{if } x \geq 0 \text{ (or } x > 0) \end{cases}$

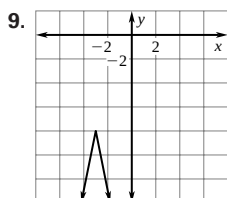
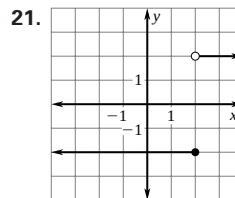
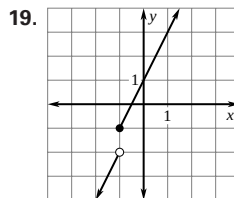
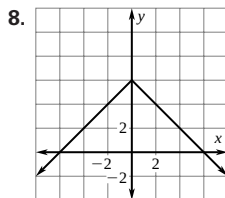
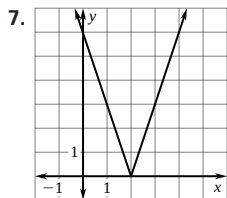
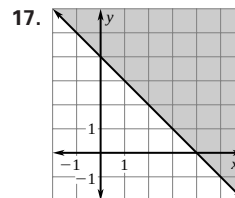
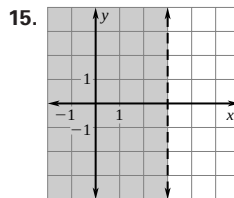
37. $f(x) = \begin{cases} \frac{3}{2}x + \frac{9}{2}, & \text{if } x < -1 \\ -1, & \text{if } x \geq -1 \end{cases}$

39. $f(x) = \begin{cases} x + 2, & \text{if } x \leq -1 \\ x + 3, & \text{if } -1 < x < 1 \\ x + 1, & \text{if } 1 \leq x \end{cases}$

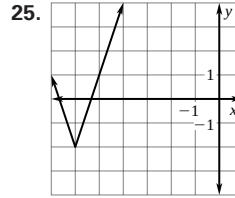
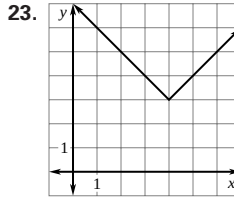




5. 7 6. 5

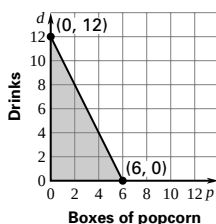


10. $y = \frac{3}{2}|x - 2|$
 11. $y = -|x + 2| + 2$
 12. $y = \frac{1}{3}|x + 1| + 2$

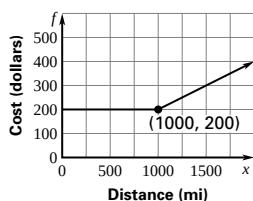


13. $2.5p + 1.25d \leq 15$;

Snacks



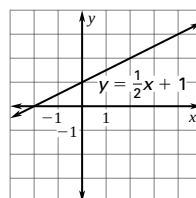
14. $f(x) = \begin{cases} 200, & \text{if } 0 < x \leq 1000 \\ 0.2x, & \text{if } x > 1000 \end{cases}$
 Rental Charges ; \$240



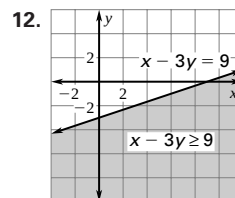
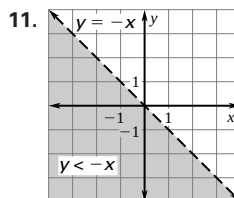
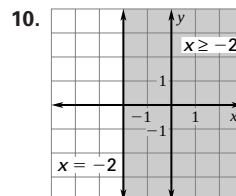
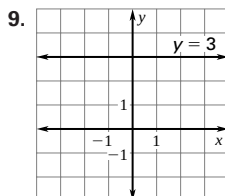
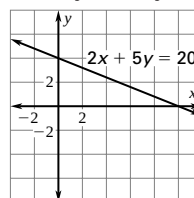
CHAPTER 3

SKILL REVIEW (p. 138) 1. no 2. yes 3. yes 4. yes 5. no

6. yes 7.

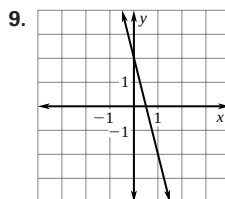
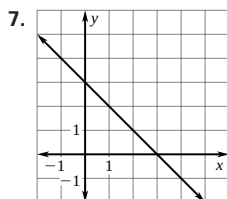


8.



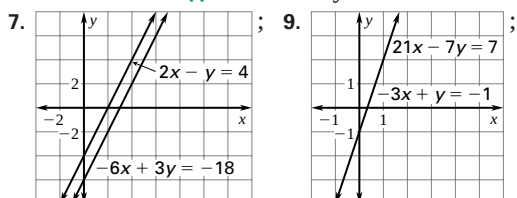
CHAPTER 2 REVIEW (pp. 130–132)

1. ; yes 3. $\frac{2}{3}$ 5. -1



11. $y = -x + 2$ 13. $y = 2x - 14$

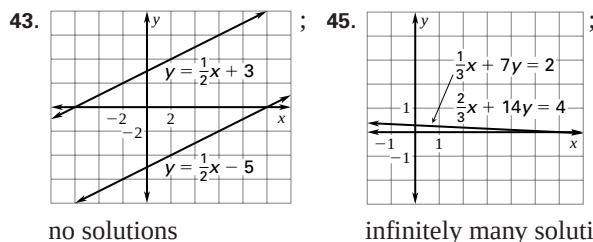
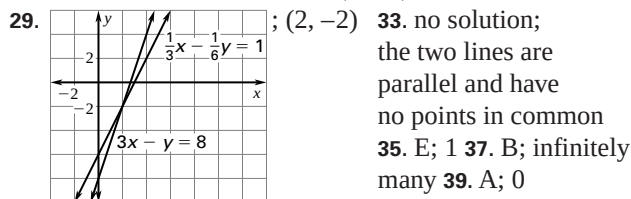
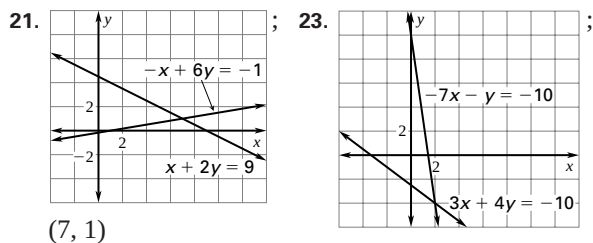
3.1 PRACTICE (pp. 142–145)



0

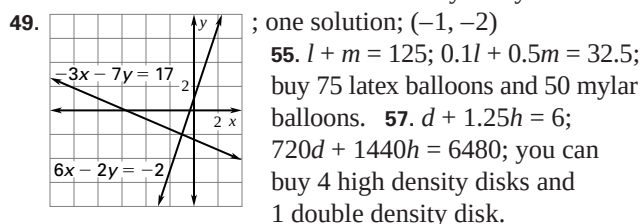
infinitely many

11. yes 13. no 15. yes 17. no 19. no



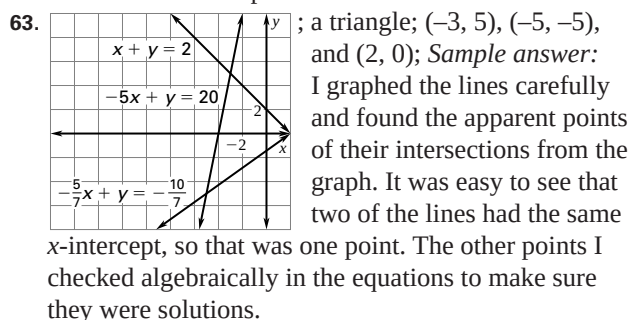
no solutions

infinitely many solutions



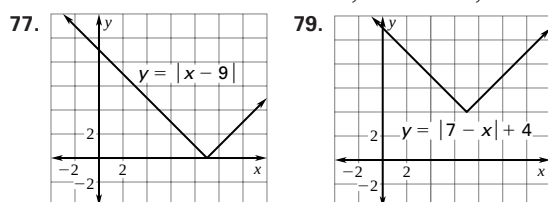
59. Let f = the travel time in hours of the first bus; let s = the travel time in hours of the second bus; $f = s + \frac{1}{12}$; 10 miles from the airport; $30f = 40s$.

61. consistent and independent



MIXED REVIEW (p. 145)

67. 36 69. -0.3 71. -2 73. no; no 75. no; no



TECHNOLOGY ACTIVITY 3.1 (p. 146)

1. (-1, 3) 3. $(\frac{141}{19}, \frac{119}{19})$, or about (7.42, 6.26)

5. $(-\frac{116}{21}, \frac{47}{21})$, or about (-5.52, 2.24)

3.2 PRACTICE (pp. 152–154)

5. (4, -1) 7. (6, 6) 9. (3, 4)
11. (4, -1) 13. (3, 3) 15. $(0, \frac{5}{2})$ 17. (-2.4, 10.2)

19. (3, -10) 21. (-2, 2) 23. $(-\frac{11}{3}, -1)$ 25. $(0, \frac{4}{5})$

27. infinitely many solutions 29. $(\frac{1}{3}, 1)$ 31. $(\frac{18}{41}, \frac{605}{82})$, or about (0.439, 7.378)

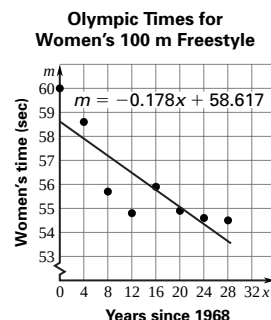
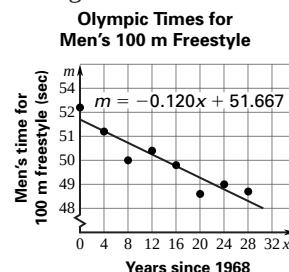
33. no solution 35. (-5, -2)

37. (5, 0) 39. no solution 41. $(-\frac{69}{11}, \frac{65}{11})$ 43. $(-\frac{25}{4}, 2.5)$

45. (20, 3) 47. no solution 49. (9, 6) 51. (2, 3) 53. (2, 2)

55. \$12; Sample answer: let x = the cost per foot of the cable itself and y = the cost of one connector. Then $6x + 2y = 15.5$ and $3x + 2y = 10.25$. Subtracting the second equation from the first, find $x = 1.75$. Then a 4-foot cable with connectors will cost $10.25 + 1.75 = \$12$. 57. inline skating: 25 min; swimming: 15 min

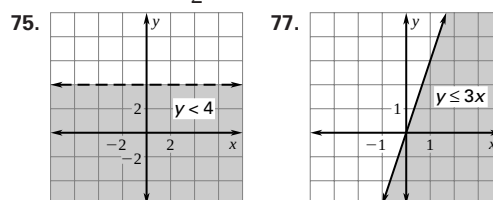
59.

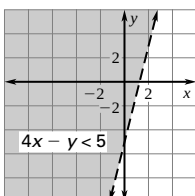


61. (119.83, 37.288); 120 years after 1968, in the year 2088 summer olympics, the men's and women's times in the 100 m freestyle will both be about 37.3 sec.

3.2 MIXED REVIEW (p. 155)

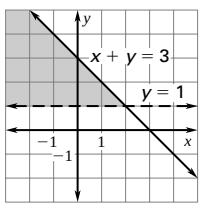
67. -8, -2 69. $-\frac{3}{2}$, 1 71. 24, -4 73. $y = 2x - 3$

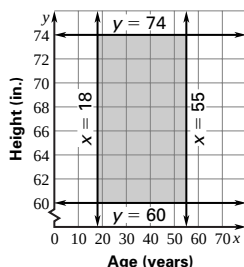


79.  81. $12x + 25 \leq 60$; $x \leq \frac{35}{12}$

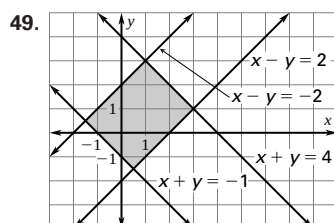
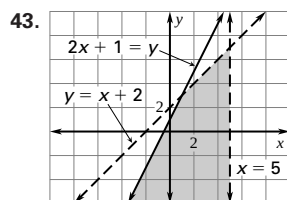
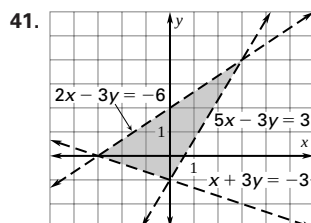
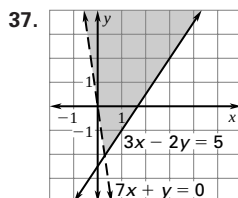
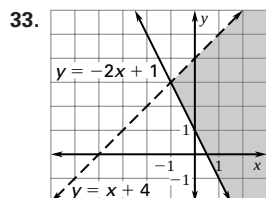
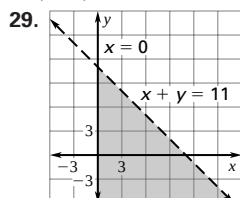
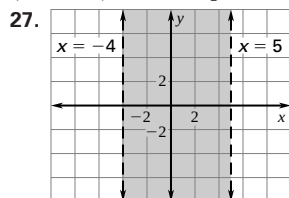
- QUIZ 1 (p. 155)** 1. $(-2, 1)$ 2. $(1, -3)$ 3. no solutions
 4. $(\frac{7}{3}, -\frac{8}{3})$ 5. $(1, 4)$ 6. $(-1, -1)$ 7. infinitely many solutions
 8. 1 9. no solutions 10. 1 11. 1 12. infinitely many solutions
 13. $(-\frac{5}{4}, -\frac{15}{4})$ 14. $(6, 6)$ 15. infinitely many solutions
 16. $(-4, \frac{7}{2})$ 17. no solution 18. $(-\frac{33}{29}, \frac{13}{29})$
 19. 371; 566

3.3 GUIDED PRACTICE (pp. 159–161) 5. no 7. yes

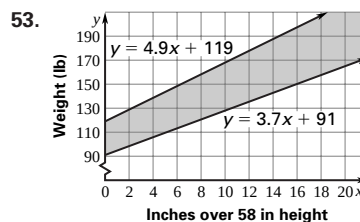
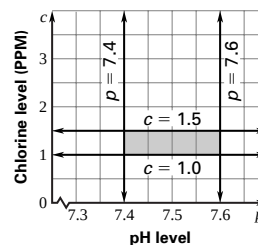
9.  11. $18 \leq x \leq 55$; $60 \leq y \leq 74$;



13. no 15. Sample answer: $(13, 10)$ 17. Sample answer: $(-2, -10)$ 19. Sample answer: $(4, 2)$ 21. C 23. F 25. A

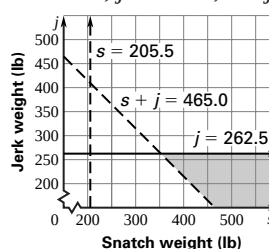


51. $7.4 \leq p \leq 7.6$, $1.0 \leq c \leq 1.5$;



55. $0.75x \leq y$; $y \leq 0.9x$;
 $20 \leq x \leq 80$

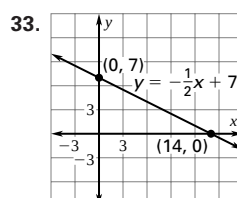
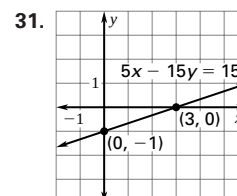
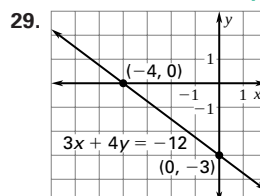
57. $s > 205.5$; $j \leq 262.5$; $s + j > 465.0$;



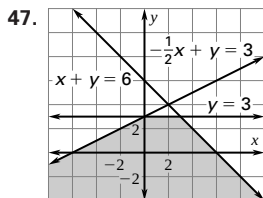
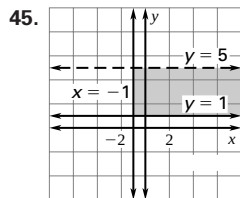
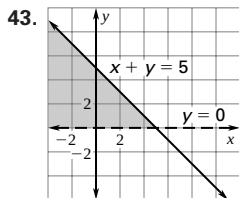
- 3.3 MIXED REVIEW (p. 162)** 67. 27 69. -13 71. relatively no correlation 73. $(\frac{58}{57}, -\frac{128}{57})$ 75. no solution 77. $(-8, 2)$

- 3.4 PRACTICE (pp. 166–167)** 5. Minimum is 0; maximum is 38. 7. max of 31 at $(17, 3)$; min of -20 at $(0, 20)$
 9. min of -40 at $(0, 40)$; max of 40 at $(40, 0)$ 11. min of 10 at $(2, 1)$; no max—feasible region is unbounded.
 13. min of 6 at $(2, 1)$; max of 29 at $(5, 6)$ 15. min of 0 at $(0, 0)$; max of 740 at $(60, 20)$ 17. no min, since feasible region is unbounded; max of 132 at $(15, 12)$ 19. min of 6 at $(0, 2)$; max of 29 at $(5, 3)$ 21. Make 37.5 gallons of Orangeade and 31.25 gallons of Berry-fruity for a profit of \$31.25. 23. Make 14 jars of tomato sauce and 4 jars of salsa for a profit of \$34.

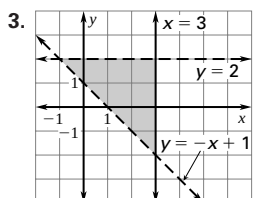
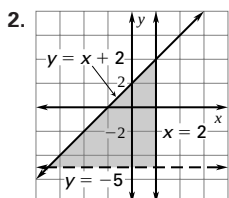
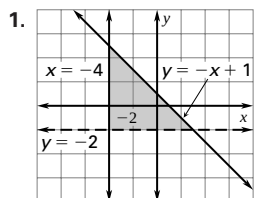
3.4 MIXED REVIEW (p. 168)



35. -7 37. -6 39. 35 41. 15

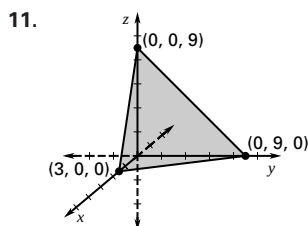
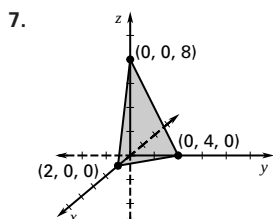
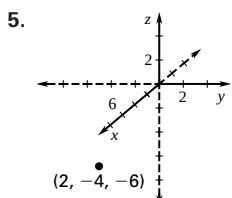


QUIZ 2 (p. 169)

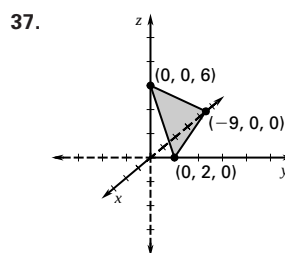
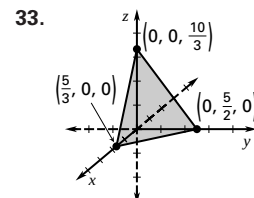
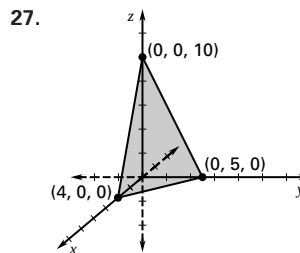
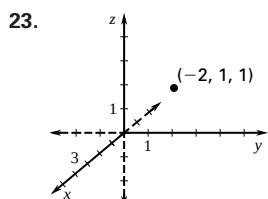
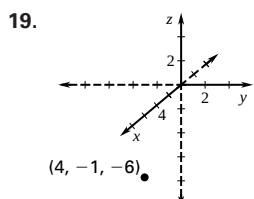


4. min of -18 at $(-4, 1)$; max of 2 at $(-2, 6)$ 5. min of 19 at $(3, 2)$; max of 24 at $(4, 2)$ 6. min of 0 at $(0, 0)$; max of 70 at $(14, 0)$ 7. 6 small boxes and 6 large boxes

3.5 PRACTICE (pp. 173–174)



15. $f(x, y) = -2x - \frac{1}{2}y - 4; -17$
17. $C = 2.25r + 2.95p + 2.65; \37.50



39. $f(x, y) = \frac{2}{5}x + y + 3; \frac{8}{5}$
41. $f(x, y) = -\frac{6}{5}x + \frac{3}{10}y + \frac{18}{5}; 12$
43. $f(x, y) = -\frac{1}{6}x - \frac{1}{4}y + \frac{1}{5}; \frac{1}{2}$

45. $f(x, y) = -\frac{1}{9}x + \frac{2}{3}y - \frac{4}{3}; \frac{121}{18}$ 47. 60

49. $C = 1.5n + p + 16$; Sample answer:

	Number of Colors				
Price of Pottery	1	2	3	4	5
\$8	\$22.50	\$27.00	\$28.50	\$30.00	\$31.50
\$18	\$35.50	\$37.00	\$38.50	\$40.00	\$41.50
\$28	\$45.50	\$47.00	\$48.50	\$50.00	\$51.50
\$38	\$55.50	\$57.00	\$58.50	\$60.00	\$61.50
\$48	\$65.50	\$67.00	\$68.50	\$70.00	\$71.50

51. $C = 0.9e + 0.25s + 20$; \$29.70; Sample answer:

	Number of Subway Trips				
Number of Express Bus Trips	2	4	6	8	10
2	\$22.30	\$22.80	\$23.30	\$23.80	\$24.30
4	\$24.10	\$24.60	\$25.10	\$25.60	\$26.10
6	\$25.90	\$26.40	\$26.90	\$27.40	\$27.90
8	\$27.70	\$28.20	\$28.70	\$29.20	\$29.70
10	\$29.50	\$30.00	\$30.50	\$31.00	\$31.50

3.5 MIXED REVIEW (p. 175)

57. $x \leq 14$;

59. $x > -2$;

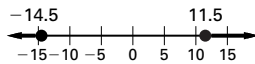
61. $18 \leq x \leq 21$; 63. neither

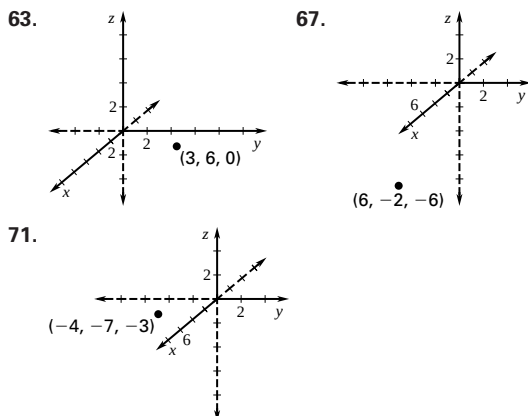
65. parallel 67. $3.95r + 3.1p = 48.5$; $r + p = 14$; buy 6 red oak boards and 8 poplar boards.

TECHNOLOGY ACTIVITY 3.5 (p. 176) 1. -14 3. 0.4 5. 21.6

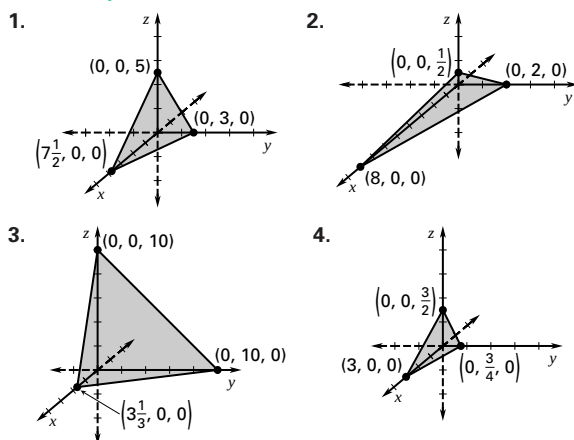
- 3.6 PRACTICE** (pp. 181–183) 5. no 7. no 9. $(5, -1, 1)$
 11. She should invest \$2000 in savings, \$12,000 in CDs, and \$6000 in bonds. 13. $(2, 1, -1)$ 15. $(6, 0, -3)$
 17. $(1, -4, 2)$ 19. $(4, 3, -3)$ 21. $(-3, 2, 5)$ 23. $(7, 3, 5)$
 25. $(-\frac{2}{7}, 0, -\frac{29}{14})$ 27. $(2, 1, 2)$ 29. $(-1, 1, -1)$ 31. $(6, 6, -4)$
 33. $(\frac{128}{13}, -\frac{113}{26}, 13.5)$ 35. $f + s + t = 20$; $5f + 3s + t = 68$;
 $s = f + t$; there were 7 first-place finishers, 10 second-place finishers, and 3 third-place finishers. 37. $s + l = 1300$;
 $s + 2c = 1400$; $s + l + c = 1600$ 39. Democrat: 50 million, Republican: 40 million, Other parties: 10 million
 41. Sample answers are given.
 a. $x + y + z = 3$; $2x - 2y + 5z = 23$; $4x + 3z = 1$
 b. $x + y + z = 3$; $2x - 2y + 5z = 23$; $4x - 4y + 10z = 11$
 c. $x + y + z = 3$; $2x - 2y + 5z = 23$; $3x - y + 6z = 26$

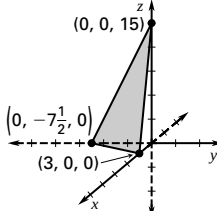
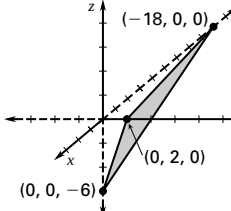
3.6 MIXED REVIEW (p. 184)

45. 11 47. 84 49. -16 51. $\frac{3}{10}$ 53. $-\frac{9}{4}$
 55. $x \leq -14.5$ or $x \geq 11.5$; 59. $-\frac{29}{3} \leq x \leq \frac{31}{3}$;


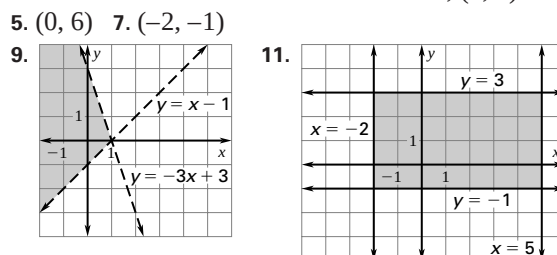
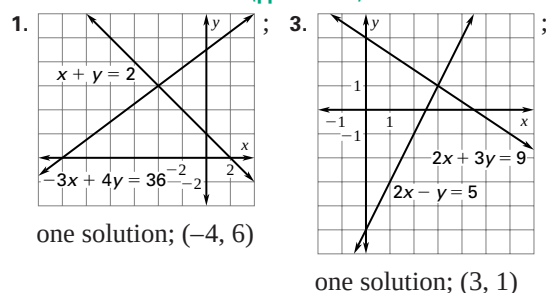



QUIZ 3 (p. 184)

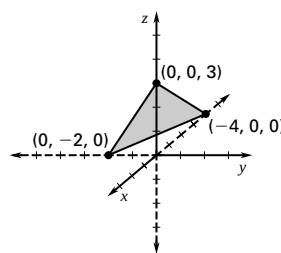


5. 
6. 
7. $f(x, y) = \frac{1}{3}x - \frac{1}{6}y + 6$; $\frac{20}{3}$ 8. $f(x, y) = \frac{1}{2}x + y + 2$; 4
 9. $f(x, y) = 20x - 3y - 15$; 66 10. $f(x, y) = \frac{1}{3}x - \frac{1}{6}y + 4$; $\frac{41}{6}$
 11. $(5, 0, 0)$ 12. $(2, -4, -1)$ 13. no solutions
 14. 3 string players, 10 woodwinds, and 2 percussionists were selected.

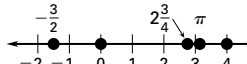
CHAPTER 3 REVIEW (pp. 186–188)

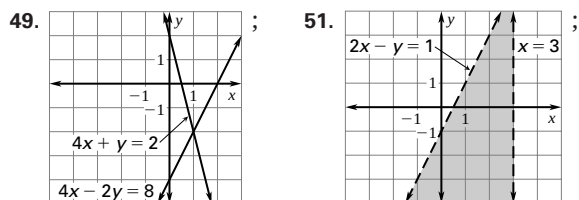
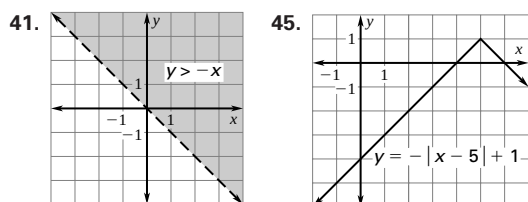
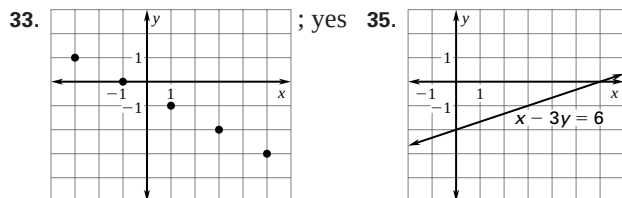
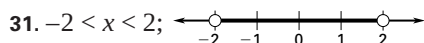
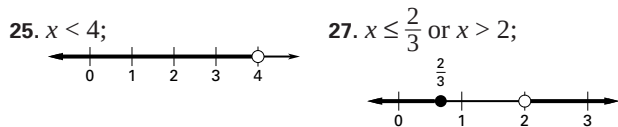


13. max of 50 at $(10, 0)$; min of 0 at $(0, 0)$
 15. max of 38 at $(4, 9)$; min of 5 at $(1, 0)$
 19. $(-\frac{1}{2}, 1, 2)$



CUMULATIVE PRACTICE (pp. 192–193)

1. $-\frac{3}{2}$, 0 , $2\frac{3}{4}$, π , 4

5. distributive property 7. -22 9. 16 11. $16a + 11$
 13. $n^2 + 2n$ 15. -8 17. -4 19. -10, 9.5 21. 10 23. $h = \frac{V}{\pi r^2}$

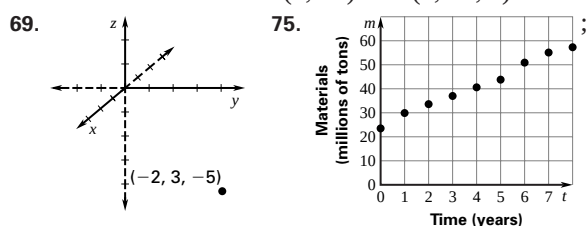


one solution at $(1, -2)$

Solution region is to the right of $2x - y = 1$ and to the left of $x = 3$.

53. perpendicular 55. $y = -3x + 7$ 57. $y = \frac{1}{2}x + 1$

59. 11 61. -4 63. 2 65. $(4, -1)$ 67. $(0, -1, 5)$



Sample answer: $y = 4.20t + 24.5$; about 83.3 million tons

77. Order 100 lb of vegetables and 50 lb of beef at a total cost of \$228.50.

CHAPTER 4

SKILL REVIEW (p. 198) 1. -1 2. -13 3. -14 4. 40

5. commutative property of multiplication 6. commutative property of addition 7. distributive property 8. $(15, 3)$

9. $(-3, -10)$ 10. $(\frac{112}{5}, -\frac{4}{5})$ 11. $(-2, -2)$

4.1 PRACTICE (pp. 203-205) 7. $\begin{bmatrix} -7 & -12 & 12 \\ -5 & 12 & -10 \end{bmatrix}$

9. $\begin{bmatrix} -25 & -6 \\ -8 & 15 \end{bmatrix}$ 11. not equal 13. not equal 15. $\begin{bmatrix} 4 & 1 \\ -12 & 4 \end{bmatrix}$

17. $\begin{bmatrix} -4 & -7 \\ 5 & 5 \end{bmatrix}$ 19. $\begin{bmatrix} 5.3 & 12.2 \\ 2.8 & 10.4 \end{bmatrix}$ 21. Not possible;

the two matrices do not have the same dimensions.

23. $\begin{bmatrix} 4 & 12 & -28 \\ 16 & 0 & -24 \end{bmatrix}$ 25. $\begin{bmatrix} 4 & 12 & 36 \\ -20 & 20 & 60 \\ -12 & -20 & -44 \end{bmatrix}$ 27. $\begin{bmatrix} -1 & -1 & -2 \\ \frac{1}{8} & \frac{3}{11} & -5 \end{bmatrix}$

29. $\begin{bmatrix} 8 & -8 \\ 12 & -3 \\ -16 & 23 \end{bmatrix}$ 31. $\begin{bmatrix} 22 & -30 \\ -22 & -18 \end{bmatrix}$ 33. $x = -3, y = -8$

35. $x = -2, y = 44$ 37-41. Matrices can also be written with the rows and columns switched.

	Before		After	
	Wins	Losses	Wins	Losses
37. Atlanta Braves	59	29	47	27
Seattle Mariners	37	51	39	34
Chicago Cubs	48	39	42	34

	1996	
	No. of units shipped (in mil)	\$ Value (in mil)
39. CDs	20,779	\$268,441
Cassettes	15,299	\$122,329
Music Videos	45	\$916

	1997	
	No. of units shipped (in mil)	\$ Value (in mil)
CDs	26,277	\$344,697
Cassettes	17,799	\$144,645
Music Videos	70	\$1,260

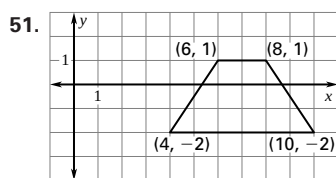
41. $\begin{bmatrix} 5,498 & \$76,256 \\ 2,500 & \$22,316 \\ 25 & \$344 \end{bmatrix}$	43. $2V + M$; $\begin{bmatrix} 146.8 & 148.4 \\ 146.1 & 147.8 \\ 146.8 & 148.4 \\ 146.2 & 148.1 \end{bmatrix}$
--	---

	Percent of Population in 1991		
	0-17	18-65	over 65
Northeast	4.8	12.6	2.8
Midwest	6.3	14.5	3.1
45. South	8.9	21.2	4.3
Mountain	1.6	3.4	0.6
Pacific	4.2	9.9	1.7

	Percent of Population in 2010		
	0-17	18-65	over 65
Northeast	4.2	11.4	2.5
Midwest	5.3	13.8	3.0
South	8.5	22.6	5.0
Mountain	1.7	4.2	0.9
Pacific	4.6	10.5	1.9

47. South: 18-65, over 65, Mountain: 0-17, 18-65, over 65, Pacific: 0-17, 18-65, over 65

4.1 MIXED REVIEW (p. 206)



53. 20 55. 7 57. $\frac{5}{14}$
 59. no, yes 61. no, yes
 63. Sample answer: (1, 2)
 65. Sample answer: (5, 5)

TECHNOLOGY ACTIVITY 4.1 (p. 207)

1. $\begin{bmatrix} 6.6 & -6.1 \\ 15.33 & 1.72 \end{bmatrix}$ 3. $\begin{bmatrix} 6.4666 & 1.6688 \\ 23.0503 & 7.301 \end{bmatrix}$
 5. $\begin{bmatrix} -8 & -1 & 0 & -1 \\ -3 & -2 & -1 & 0 \end{bmatrix}$; none; Rock CDs, Country CDs,
 Easy Listening CDs, Rock tapes, Country tapes, Jazz tapes

4.2 PRACTICE (pp. 211–212)

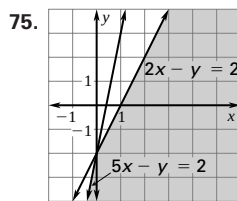
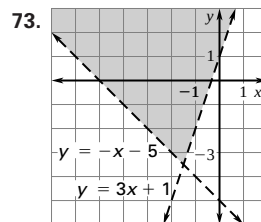
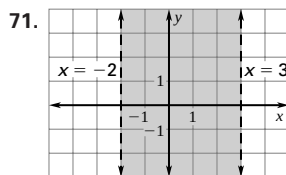
5. defined; 3×3
 7. $\begin{bmatrix} 2 & 0 \\ -5 & -3 \end{bmatrix}$ 9. $\begin{bmatrix} -9 & -3 \\ 7 & 2 \\ 2 & 1 \end{bmatrix}$ 11. defined; 1×2
 13. not defined 15. defined; 3×1 17. [2] 19. $\begin{bmatrix} 4 & 11 \\ 12 & 3 \end{bmatrix}$
 21. Not defined; the number of columns in the left matrix (3) does not equal the number of rows in the right matrix (2).
 23. $\begin{bmatrix} -1.3 \\ 0.9 \end{bmatrix}$ 25. $\begin{bmatrix} -32 & 0 & 32 \\ 12 & -26 & 1 \\ 20 & -30 & -5 \end{bmatrix}$ 27. $\begin{bmatrix} 16 & -16 \\ 16 & -8 \end{bmatrix}$
 29. $\begin{bmatrix} 8 & -5 & 8 \\ -1 & 1 & 1 \\ 7 & -30 & -35 \end{bmatrix}$ 31. $\begin{bmatrix} 0 & -30 \\ 12 & -51 \end{bmatrix}$ 33. $x = 2, y = 8$
 35. $\begin{bmatrix} 0.201 & 0.348 & 0.180 \\ 0.220 & 0.215 & 0.017 \\ 0.073 & 0.001 & 0.005 \\ 0.113 & 0.014 & 0.405 \end{bmatrix}$ 37. Matrix B $\begin{bmatrix} 6 \\ 5 \\ 4 \end{bmatrix}$
 39. Team 3; 62 points
4.2 MIXED REVIEW (p. 213) 45. 180 m^2 47. $9\pi \text{ ft}^2$, or about 28.26 ft^2 49. $y = -\frac{1}{4}x + 4$ 51. $y = 3x + 2$
 53. $y = \frac{3}{2}x - 6$ 55. $(-7, 5)$ 57. no solution 59. $(0, -5)$
 61. $\left(-\frac{49}{37}, -\frac{52}{37}\right)$
4.3 PRACTICE (pp. 218–220) 5. -6 7. 28 9. $(-5, 1)$
 11. 1750 in.^2 13. 24 15. 63 17. -31 19. 24 21. -77
 23. 360 25. 116 27. 81 29. -732 31. 6 33. 11 35. 6
 37. $(-2, -5)$ 39. $(4, -1)$ 41. $(6, 2)$ 43. $\left(\frac{584}{11}, \frac{480}{11}\right)$
 45. $(0, 5, 4)$ 47. $\left(-\frac{2}{3}, -34, -12\right)$ 49. $(4, 3, -2)$
 51. $\left(\frac{1}{11}, \frac{34}{11}, \frac{19}{11}\right)$ 53. $\left(-\frac{1}{44}, -\frac{69}{22}, -\frac{481}{88}\right)$ 55. 144 ft^2
 57. 4 in.^2 59. regular: \$1.03 per gal, premium: \$1.15 per gal

61. The determinant is multiplied by -1 . Proof for

$$2 \times 2 \text{ matrices: } -1 \begin{vmatrix} a & b \\ c & d \end{vmatrix} = -1(ad - bc) = bc - ad = \begin{vmatrix} b & a \\ d & c \end{vmatrix}$$

4.3 MIXED REVIEW (p. 221)

65. -3 67. 4 69. $\frac{5}{4}$



77. $\begin{bmatrix} -24 & 14 \\ 33 & -8 \end{bmatrix}$ 79. $\begin{bmatrix} -104 & 35 \\ 32 & -4 \end{bmatrix}$
 81. $\begin{bmatrix} 12 & 2.7 \\ 4 & 0.92 \end{bmatrix}$

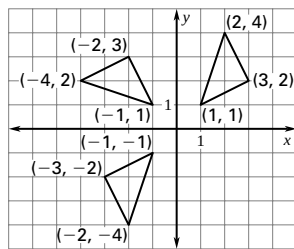
QUIZ 1 (p. 221)

1. $\begin{bmatrix} -5 & 4 & 15 \\ 2 & -14 & 1 \end{bmatrix}$ 2. $\begin{bmatrix} -5 & -7 \\ 0 & -1 \end{bmatrix}$
 3. $\begin{bmatrix} -2 & -2 \\ -18 & -12 \end{bmatrix}$ 4. $\begin{bmatrix} -4 & -2 & 22 \\ 3 & -18 & 20 \\ -17 & -4 & 1 \end{bmatrix}$ 5. $\begin{bmatrix} 26 & 56 \\ 22 & 42 \end{bmatrix}$
 6. $\begin{bmatrix} 5 & -15 \\ 38 & -12 \end{bmatrix}$ 7. 10 8. 0 9. 70 10. -15 11. $(1, 2)$
 12. $\left(\frac{4}{9}, -\frac{13}{3}\right)$ 13. $\left(2, \frac{1}{2}\right)$ 14. $\left(\frac{5}{2}, 1, -\frac{3}{2}\right)$ 15. $\left(\frac{7}{3}, 10, -\frac{4}{3}\right)$
 16. $(0, -4, 3)$ 17. 12 ft^2

4.4 PRACTICE (pp. 227–228)

7. $\begin{bmatrix} -\frac{1}{3} & -\frac{2}{3} \\ 0 & -1 \end{bmatrix}$ 9. $\begin{bmatrix} \frac{2}{65} & -\frac{32}{65} \\ \frac{16}{65} & \frac{4}{65} \end{bmatrix}$
 11. $\begin{bmatrix} -0.0329 & 0.3289 \\ 0.5263 & -0.2632 \end{bmatrix}$ 13. $\begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix}$ 15. $\begin{bmatrix} -7 & 8 \\ 1 & -1 \end{bmatrix}$
 17. $\begin{bmatrix} 1 & -2 \\ -3 & 7 \end{bmatrix}$ 19. $\begin{bmatrix} 1 & \frac{7}{2} \\ -1 & -3 \end{bmatrix}$ 21. $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} \\ \frac{3}{2} & \frac{11}{6} \end{bmatrix}$ 23. $\begin{bmatrix} 5 & -1.25 \\ -4 & 1.1 \end{bmatrix}$
 25. $\begin{bmatrix} \frac{37}{25} & -\frac{1}{5} \\ -\frac{4}{5} & 0 \end{bmatrix}$ 27. $\begin{bmatrix} -4 & 2 & -7 \\ 3 & -1 & 5 \end{bmatrix}$ 29. $\begin{bmatrix} \frac{17}{5} & \frac{136}{5} \\ -\frac{8}{5} & -\frac{64}{5} \end{bmatrix}$
 31. $\begin{bmatrix} 11 & -2 \\ 8 & -1.5 \end{bmatrix}$ 33. no 35. yes
 37. $\begin{bmatrix} -0.0654 & -0.0131 & 0.1634 \\ 0.0131 & 0.2026 & -0.0327 \\ 0.1503 & -0.1699 & 0.1242 \end{bmatrix}$ 39. $\begin{bmatrix} 12 & -7 & 3 \\ -20 & 12 & -5 \\ 1.5 & -1 & 0.5 \end{bmatrix}$
 41. 39, 98, 26, 77, 20, 60, 13, 31, 23, 51
 43. 36, -14, 16, 0, 125, -50, -26, 14, 10, 4, 24, -8, -95, 48
 45. KARNAK TEMPLE 47. THE GREAT SPHINX

49. a. $\begin{bmatrix} -1 & -4 & -2 \\ 1 & 2 & 3 \end{bmatrix}; \begin{bmatrix} -1 & -2 & -3 \\ -1 & -4 & -2 \end{bmatrix};$



; 90° rotation
b. Sample answer: Find A^{-1} and then multiply AAT by A^{-1} on the left: $A^{-1}AAT = IAT = AT$. Now multiply AT by A^{-1} on the left: $A^{-1}AT = IT = T$.

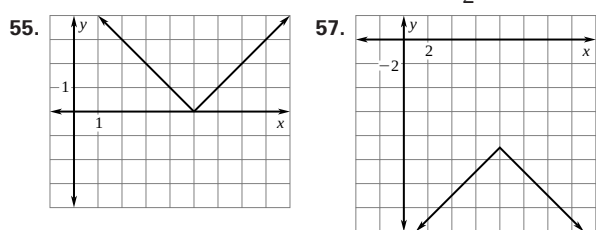
4.4 MIXED REVIEW (p. 229)

55. all real numbers 57. $(4, 0, -2)$ 59. $(\frac{1}{2}, 4, \frac{1}{4})$
61. Not possible; the matrices have different dimensions.
63. $\begin{bmatrix} 17 & -3 & -1 \\ 0 & 25 & 31 \end{bmatrix}$ 65. $\begin{bmatrix} 2 & 5 & 1 \\ 3 & 4 & 8 \end{bmatrix}$

4.5 PRACTICE (pp. 233–235)

5. $\begin{bmatrix} 1 & 3 \\ 4 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 9 \\ 7 \end{bmatrix}$ 7. $(-5, 7)$ 9. $(\frac{21}{13}, -\frac{2}{13})$
11. $\begin{bmatrix} 1 & 1 \\ 3 & -4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 8 \end{bmatrix}$ 13. $\begin{bmatrix} 5 & -3 \\ -4 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 9 \\ 10 \end{bmatrix}$
15. $\begin{bmatrix} 1 & 8 \\ 4 & -5 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ -11 \end{bmatrix}$ 17. $\begin{bmatrix} 1 & -4 & 5 \\ 2 & 1 & -7 \\ -4 & 5 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -4 \\ -23 \\ 38 \end{bmatrix}$
19. $\begin{bmatrix} 0.5 & 3.1 & -0.2 \\ 1.2 & -2.5 & 0.7 \\ 0.3 & 4.8 & -4.3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 5.9 \\ 2.2 \\ 4.8 \end{bmatrix}$
21. $\begin{bmatrix} 0 & 8 & -10 \\ 0 & 6 & -12 \\ -9 & 0 & 5 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -23 \\ 14 \\ 0 \end{bmatrix}$ 23. $(5, -7)$ 25. $(5, -9)$
27. $(1, -7)$ 29. $(-1, -4)$ 31. $(-3, -14)$ 33. $(-61, 179, -83)$
35. $(4, 3, 1)$ 37. $(2, 3, -2)$ 39. $(3, -2, 6)$ 41. 2239.8 g of A, 1313.6 g of B, 4067.6 g of C 43. transformer: \$10.00, wire: \$.20 per ft, light: \$1.00

4.5 MIXED REVIEW (p. 235)



61. $\begin{bmatrix} 3 & 4 \\ 5 & 7 \end{bmatrix}$ 65. $\begin{bmatrix} 1 & -2 \\ -\frac{3}{2} & \frac{7}{2} \end{bmatrix}$

QUIZ 2 (p. 236)

1. $\begin{bmatrix} 2 & -1 \\ -7 & 4 \end{bmatrix}$ 2. $\begin{bmatrix} -3 & -5 \\ -4 & -7 \end{bmatrix}$ 3. $\begin{bmatrix} -\frac{1}{3} & -\frac{1}{9} \\ -1 & -\frac{2}{3} \end{bmatrix}$ 4. $\begin{bmatrix} 7 & -5 \\ -4 & 3 \end{bmatrix}$

5. $(-1, 4)$ 6. $(4, 3)$ 7. $(3, -3)$ 8. place setting: \$35.50, serving set: \$67.00

CHAPTER 4 EXTENSION (p. 238)

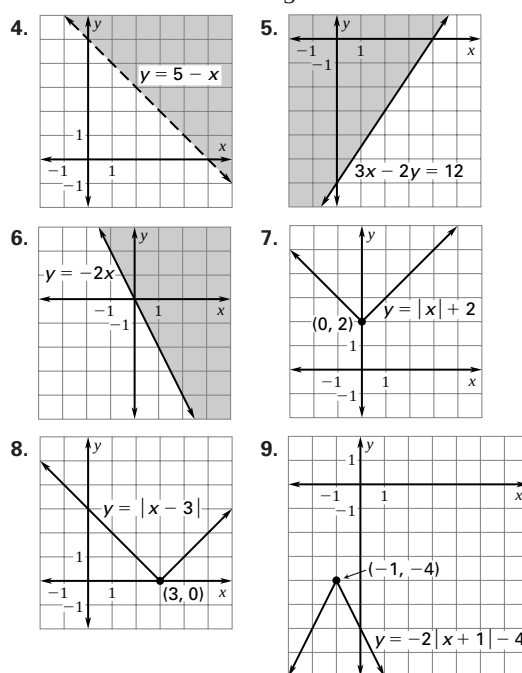
1. $(-2, 5)$ 3. $(-1, -4)$
5. $(4, -5)$ 7. $(2, 1)$ 9. $(0, \frac{1}{5})$ 11. $(16, -5, 2)$ 13. $(-5, 2, 0)$
15. $(-16, 12, 10)$

CHAPTER 4 REVIEW (pp. 240–242)

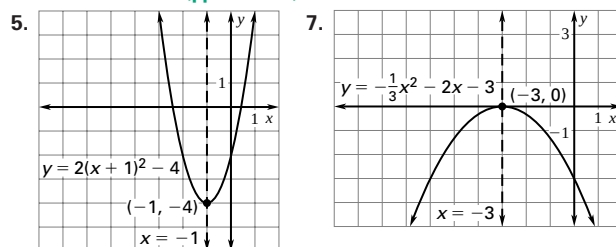
1. $\begin{bmatrix} 15 & -5 \\ 1 & 5 \end{bmatrix}$ 3. $\begin{bmatrix} 8 & 11 \\ 9 & 13 \\ 8 & 6 \end{bmatrix}$ 5. $\begin{bmatrix} 8 & 12 & -2 \\ 20 & -10 & 4 \\ 0 & 22 & 2 \end{bmatrix}$ 7. $x = -1, y = 10$
9. $x = -1, y = 5$ 11. $\begin{bmatrix} -120 & -84 \\ 40 & 28 \end{bmatrix}$ 13. $\begin{bmatrix} 17 & -29 & 64 \\ 18 & -36 & 72 \end{bmatrix}$
15. 12 17. 4 19. $(-1, -1)$ 21. $(6, 0, -3)$
23. $\begin{bmatrix} \frac{3}{4} & -\frac{1}{2} \\ -\frac{1}{4} & \frac{1}{2} \end{bmatrix}$ 25. $\begin{bmatrix} 1 & 1 \\ 5 & 6 \end{bmatrix}$ 27. $\begin{bmatrix} -3 & -2 \\ 4 & 3 \end{bmatrix}$ 29. $(\frac{5}{2}, \frac{3}{2})$
31. $(4, 1, 0)$ 33. $(-3, 2, 4)$

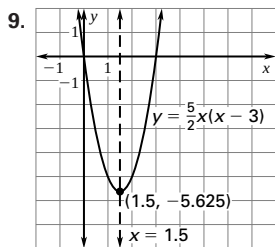
CHAPTER 5

SKILL REVIEW (p. 248)



5.1 PRACTICE (pp. 253–254)



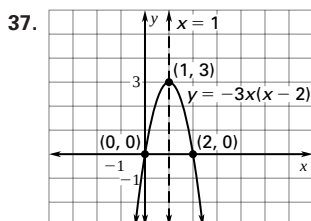
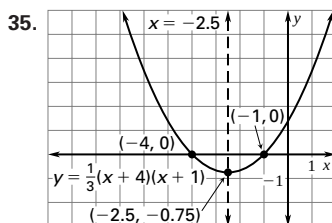
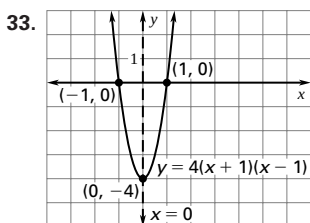
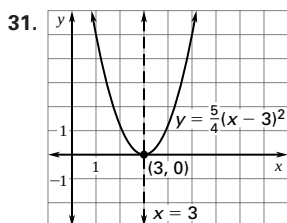
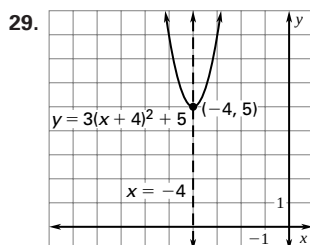
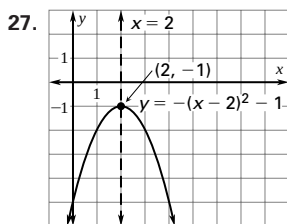
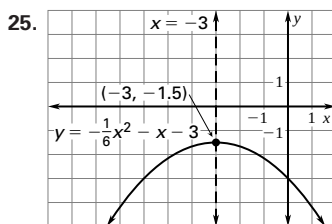
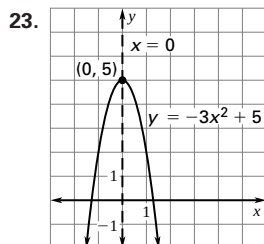
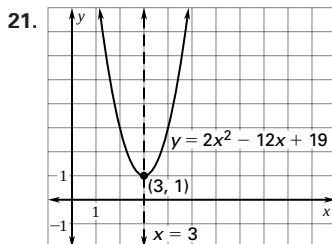


11. $y = -2x^2 - 2x + 24$

13. $y = -x^2 - 4x - 11$

15. $y = \frac{2}{3}x^2 - 12x + 50$

17. C 19. B



39. $y = -x^2 + x + 12$

41. $y = -3x^2 + 9x + 84$

43. $y = x^2 + 6x + 11$

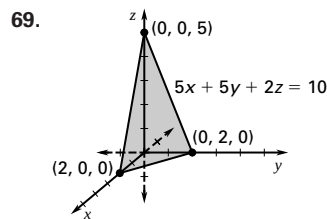
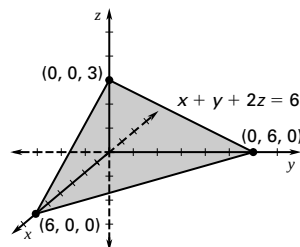
45. $y = -6x^2 + 24x - 33$

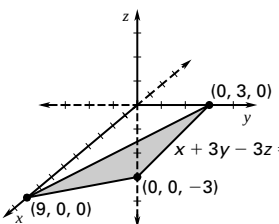
47. $y = -81x^2 - 32x - 4$

49. $y = 32x^2 - 8x - 1$

51. about 3,090 revolutions per min; about 74.7 foot-pounds 53. *Sample answer:* The energy use decreases until about 90 meters per minute and then increases.

5.1 MIXED REVIEW (p. 255) 57. 2 59. -7 61. -5 63. 7 65. -3 67.



71.  73. (2, 1) 75. (2, -4, 1)
77. (7, 2.5, -0.5)

5.2 PRACTICE (pp. 260–262) 5. $(2x + 3)(x - 1)$ 7. $(y + 1)^2$

9. $q(q + 1)$ 11. -2, 4 13. $-\frac{1}{2}, \frac{1}{2}$ 15. 0, 6

17. $y = (x + 4)(x + 2)$; -4, -2 19. $y = (x + 5)^2$; -5

21. $y = (3x - 2)(x - 2)$; $\frac{2}{3}, 2$ 23. $(x + 4)(x + 1)$

25. $(x + 5)(x + 8)$ 27. $(x - 6)(x - 2)$ 29. $(a + 5)(a - 2)$

31. $(c + 10)(c - 8)$ 33. cannot be factored

35. $(2x + 1)(x + 3)$ 37. $(4x + 3)(2x + 3)$ 39. cannot be factored

41. $(3k - 1)(k + 11)$ 43. $(3n - 2)(6n + 7)$

45. $(3v - 7)(4v + 1)$ 47. $(x - 5)(x + 5)$ 49. $(x - 3)^2$

51. $(3s + 2)^2$ 53. $(7 - 10a)(7 + 10a)$ 55. $(9c + 11)^2$

57. $2(3x - 1)(3x + 1)$ 59. $4(2y + 3)(y - 5)$ 61. $u(u + 7)$

63. $-(v - 1)^2$ 65. -1, 4 67. $\frac{3}{5}, 2$ 69. -12 71. $-\frac{4}{9}, \frac{4}{9}$

73. -5, 6 75. $\frac{1}{4}$ 77. $-1, \frac{8}{3}$ 79. $-\frac{9}{2}, 0$ 81. $y = (x + 4)(x + 3)$;

-4, -3 83. $y = (x - 2)(x + 2)$; -2, 2 85. $y = x(x - 3)$; 0, 3

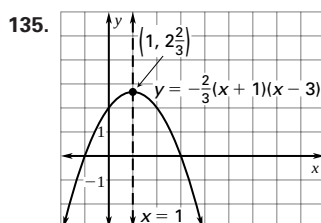
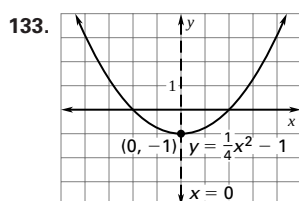
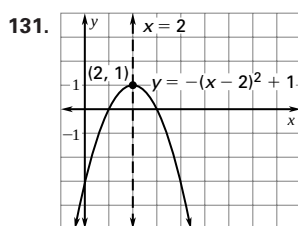
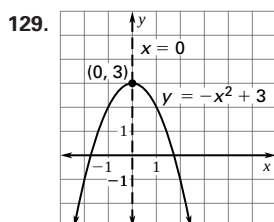
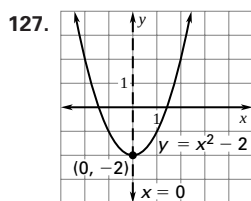
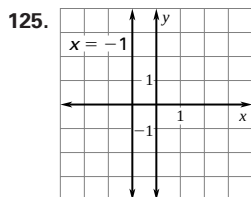
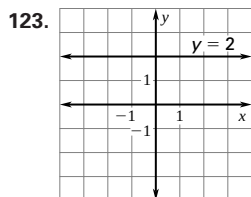
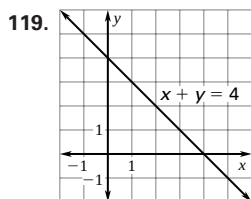
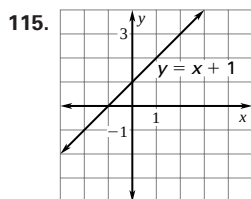
87. $y = -(x - 8)^2$; 8 89. a. $m + n = 0$, $mn = 9$ b. If $m + n = 0$, then $m = -n$. Substituting in $mn = 9$, $(-n)(n) = 9$, $-n^2 = 9$, and $n^2 = -9$. There is no number such that $n^2 = -9$.

Therefore, $x^2 + 9$ is not factorable. 91. 60 ft 93. 7 95. 6

97. 2.5 ft 99. \$80; \$12,800 101. about 70 mi; about 24 mi

5.2 MIXED REVIEW (p. 263) 107. -4, 8 109. -2, 3.6

111. $-4 < x < 2$ 113. $x < -3$ or $x > 11$



5.3 PRACTICE (pp. 267–268) 5. $2\sqrt{3}$ 7. 9 9. $\frac{\sqrt{7}}{3}$ 11. $\frac{\sqrt{10}}{2}$

13. -5, 5 15. $-2\sqrt{3}$, $2\sqrt{3}$ 17. $-2\sqrt{7} - 8$, $2\sqrt{7} - 8$

19. $3\sqrt{2}$ 21. $3\sqrt{3}$ 23. $6\sqrt{2}$ 25. $7\sqrt{2}$ 27. 14 29. 6

31. $2\sqrt{6}$ 33. $12\sqrt{7}$ 35. $\frac{1}{3}$ 37. $\frac{6}{5}$ 39. $\frac{\sqrt{3}}{4}$ 41. $\frac{5\sqrt{3}}{6}$

43. $\frac{2\sqrt{3}}{3}$ 45. $\frac{\sqrt{30}}{5}$ 47. $\frac{\sqrt{14}}{4}$ 49. $\frac{3\sqrt{10}}{8}$ 51. -11, 11

53. -6, 6 55. $-5\sqrt{3}$, $5\sqrt{3}$ 57. $-10\sqrt{3}$, $10\sqrt{3}$ 59. -12, 12

61. -6, 4 63. $-3\sqrt{3} + 7$, $3\sqrt{3} + 7$ 65. -1, 13 67. -2, 7

69. about 3.3 sec 71. Earth: 3.5 sec; Mars: 5.8 sec;

Jupiter: 2.2 sec; Neptune: 3.3 sec; Pluto: 13.8 sec

73. 16.2 in. by 21.6 in. 75. a. about 60.6 sec b. 146 sec

c. *Sample answer:* The water drains more slowly as the time increases.

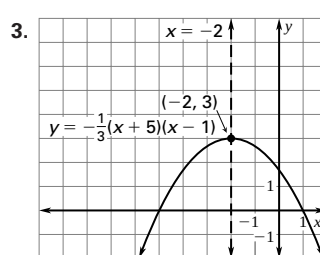
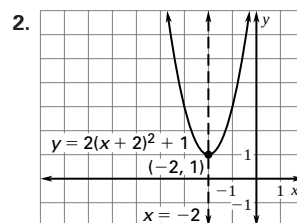
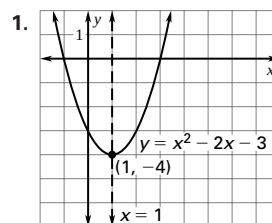
5.3 MIXED REVIEW (p. 269) 77. (1, 2) 79. (-3, -5)

81. (6, -2) 83. $\begin{bmatrix} 13 & -1 \\ -11 & 1 \end{bmatrix}$ 85. $\begin{bmatrix} 81 & 57 \\ -40 & -31 \end{bmatrix}$

87. $y = x^2 - 9x + 8$ 89. $y = 16x^2 - 81$

91. $y = 5x^2 + 60x + 168$

QUIZ 1 (p. 270)



4. -3, 9 5. $-4, -\frac{5}{4}$ 6. $\frac{1}{2}$

7. $3\sqrt{6}$ 8. $14\sqrt{5}$

9. $\frac{6\sqrt{5}}{5}$ 10. $\frac{2\sqrt{3}}{3}$

11. about 2.7 mi/h

TECHNOLOGY ACTIVITY 5.3 (p. 271) 1. -1.53, 1.53

3. -2.45, 2.45 5. -2.73, 0.73 7. -3.65, 1.65

9. $48\pi = 6\pi r^2$; $r \approx 2.8$ in.

5.4 PRACTICE (pp. 277–279) 5. $-2i\sqrt{2}$, $2i\sqrt{2}$ 7. $7 + 3i$

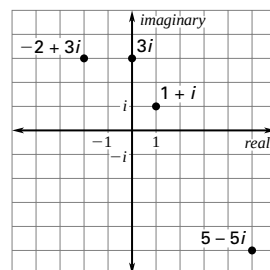
9. $9 - 5i$ 11. $\sqrt{2}$ 13. $\sqrt{13}$ 15.

17. $-2i$, $2i$ 19. $-3i\sqrt{3}$, $3i\sqrt{3}$

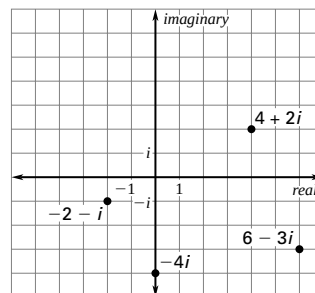
21. $-i\sqrt{3}$, $i\sqrt{3}$ 23. $-i$, i

25. $2 + 4i$, $2 - 4i$

27. $-3 - 2i\sqrt{14}$, $-3 + 2i\sqrt{14}$



29–35 odd:



37. $9 + 4i$

39. -8

41. $7 + 3i$

43. $0.2 - 0.1i$

45. $3 + 6i$

47. $-1 + 3i$

49. $70 - 40i$

51. $-9 + 23i$

53. 74

55. $161 - 240i$ 57. $-1 + i$ 59. $\frac{4}{5} + \frac{3}{5}i$ 61. $-\frac{87}{97} + \frac{26}{97}i$

63. $\frac{17}{19} - \frac{6\sqrt{2}}{19}i$ 65. 13 67. $5\sqrt{2}$ 69. $4\sqrt{5}$ 71. 4

73. *Sample answer:* It does because the absolute values are equal to or less than $N = 1$. 75. *Sample answer:* It does not because the absolute values become infinitely large.

77. *Sample answer:* It does not because the absolute values become infinitely large. 79. *Sample answer:* It does because the absolute values are less than $N = 1$.

81. true

83. false; *Sample answer:* $(6 + 3i) + (-5 - 3i) = 1$, which is not imaginary. 85. true

87. true; true 89. false; false 91. false; false 95. a. $2 - 2i$
b. $12 - 7i$ c. $8 - 4i$

5.4 MIXED REVIEW (p. 280) 101. 11 103. 3 105. (1, 2)

107. (4, -3) 109. -8, 4 111. $5 + \sqrt{10}$, $5 - \sqrt{10}$

113. $6 + \sqrt{7}$, $6 - \sqrt{7}$

5.5 PRACTICE (pp. 286–289) 5. 49; $(x + 7)^2$ 7. 25; $(x - 5)^2$
9. $\frac{169}{4}$; $(x - \frac{13}{2})^2$ 11. $1 - \sqrt{5}$, $1 + \sqrt{5}$ 13. $-4 - \sqrt{7}$, $-4 + \sqrt{7}$

15. $2 - 3i\sqrt{3}$, $2 + 3i\sqrt{3}$ 17. $y = (x - 2)^2 + 3$; (2, 3)

19. $y = (x + 5)^2 - 8$; (-5, -8) 21. $y = 2(x + 1)^2 - 6$; (-1, -6)

23. $(x + 8)^2$ 25. $(x - 12)^2$ 27. $(x + 0.5)^2$ 29. $(x - \frac{3}{2})^2$

31. $(x - \frac{2}{9})^2$ 33. 81; $(x + 9)^2$ 35. 484; $(x - 22)^2$ 37. $\frac{121}{4}$;

$(x - \frac{11}{2})^2$ 39. $\frac{225}{4}$; $(x + \frac{15}{2})^2$ 41. 8.41; $(x - 2.9)^2$

43. 22.09; $(x + 4.7)^2$ 45. $\frac{25}{9}$; $(x + \frac{5}{3})^2$ 47. $-1 + \sqrt{10}$,

$-1 - \sqrt{10}$ 49. $-10 + 2i$, $-10 - 2i$ 51. $3 - 2\sqrt{11}$, $3 + 2\sqrt{11}$

53. $-0.9 - \sqrt{2.31}$, $-0.9 + \sqrt{2.31}$ 55. $3 + \sqrt{2}$, $3 - \sqrt{2}$

57. $-7 - i$, $-7 + i$ 59. $\frac{5 - 2\sqrt{3}}{2}$, $\frac{5 + 2\sqrt{3}}{2}$ 61. $\frac{-1 - i}{2}$, $\frac{-1 + i}{2}$

63. -6, 2 65. $-\frac{\sqrt{23}}{3}$, $\frac{\sqrt{23}}{3}$ 67. $\frac{1 - i\sqrt{71}}{6}$, $\frac{1 + i\sqrt{71}}{6}$

69. $-1 - 4\sqrt{2}$, $-1 + 4\sqrt{2}$ 71. $11 - 13i$, $11 + 13i$

73. $y = (x - 3)^2 + 2$; (3, 2) 75. $y = (x + 8)^2 - 50$; (-8, -50)

77. $y = (x - \frac{3}{2})^2 - \frac{17}{4}$; $(\frac{3}{2}, -\frac{17}{4})$ 79. $y = -(x - 10)^2 + 20$;

(10, 20) 81. $y = 3(x - 2)^2 - 11$; (2, -11)

83. $y = 1.4(x + 2)^2 - 2.6$; (-2, -2.6) 85. $-5 + 5\sqrt{5}$,

or ≈ 6.18 87. $\sqrt{39} - 2$, or ≈ 4.24 89. $d = 0.08(30)^2 +$

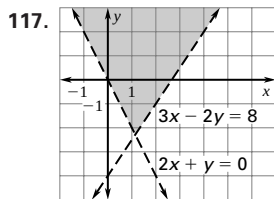
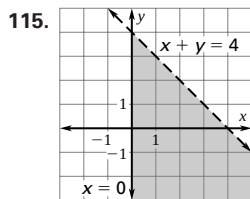
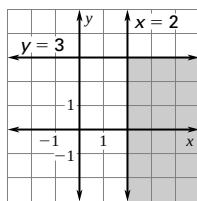
$1.1(30) = 105$ ft; about 25.5 mi/h 91. 45.50 ft; 161.16 ft

93. about 1 cm 95. 507.5°F ; 3.91 Btu/ft^3

5.5 MIXED REVIEW (p. 289) 101. 17 103. 52 105. 0

107. $y = 2x - 5$ 109. $y = -5x - 25$

111. $y = \frac{1}{3}x + 7$ 113.



TECHNOLOGY ACTIVITY 5.5 (p. 290)

1–9 odd: Estimates may vary. 1. minimum; -4.25; 2.5

3. minimum; 4; -3 5. maximum; 8.125; -0.75

7. minimum; 2.375; 3.75 9. maximum; 8.65; 2.29

5.6 PRACTICE (pp. 295–297)

5. $\frac{-1 + \sqrt{5}}{2}$, $\frac{-1 - \sqrt{5}}{2}$ 7. $\frac{-1 + \sqrt{2}}{3}$, $\frac{-1 - \sqrt{2}}{3}$

9. $\frac{1}{2} + 3i$, $\frac{1}{2} - 3i$ 11. -16; 2 imaginary 13. -47; 2 imaginary

15. 261; 2 real 17. -2, 7 19. $1 + \sqrt{5}$, $1 - \sqrt{5}$ 21. $-3 - 7i$,

$-3 + 7i$ 23. $\frac{-3 + \sqrt{29}}{10}$, $\frac{-3 - \sqrt{29}}{10}$ 25. $\frac{-1 + i\sqrt{7}}{4}$, $\frac{-1 - i\sqrt{7}}{4}$

27. -1 , $\frac{9}{7}$ 29. $\frac{-9 + \sqrt{33}}{8}$, $\frac{-9 - \sqrt{33}}{8}$ 31. $-\frac{2}{5} + \frac{\sqrt{26}}{10}$,

$-\frac{2}{5} - \frac{\sqrt{26}}{10}$ 33. -9, 11 35. $4 + i\sqrt{19}$, $4 - i\sqrt{19}$

37. $-8 + 3\sqrt{2}$, $-8 - 3\sqrt{2}$ 39. $\frac{1}{2} + \frac{\sqrt{6}}{4}$, $\frac{1}{2} - \frac{\sqrt{6}}{4}$ 41. $5 + \frac{i}{2}$,

$5 - \frac{i}{2}$ 43. $\frac{1}{3}$, $-\frac{5}{3}$ 45. $\frac{-9.5 + \sqrt{218.17}}{7.8}$, $\frac{-9.5 - \sqrt{218.17}}{7.8}$

47. $\frac{3 + \sqrt{69}}{2}$, $\frac{3 - \sqrt{69}}{2}$ 49. 2, 16 51. $-4 + 3i$, $-4 - 3i$

53. $\frac{\sqrt{3}}{2}$, $-\frac{\sqrt{3}}{2}$ 55. $-\frac{3}{2}$, $\frac{1}{7}$ 57. 33; 2 real 59. 160; 2 real

61. -7; 2 imaginary 63. -19; 2 imaginary 65. zero

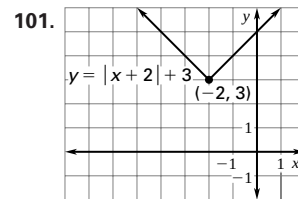
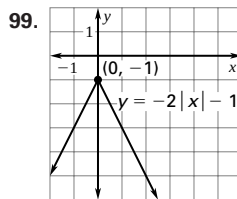
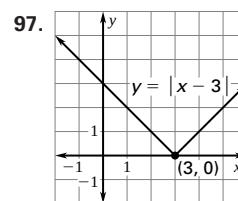
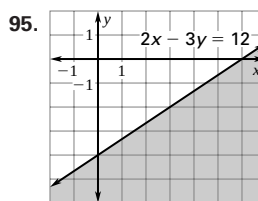
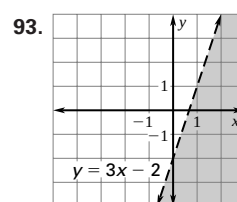
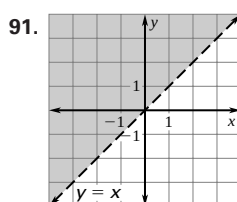
67. positive 69. $c < 4$; $c = 4$; $c > 4$ 71. $c < 16$; $c = 16$;

$c > 16$ 73. $c < 36$; $c = 36$; $c > 36$ 75. about 2.56 sec

77. about 0.17 sec 79. 1993

5.6 MIXED REVIEW (p. 298)

85. $x > 2$ 87. $x \geq -13$ 89. $3 \leq x \leq 8$



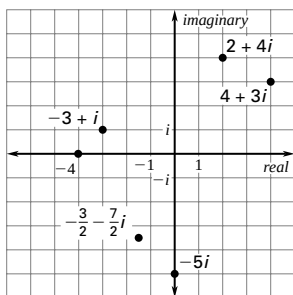
QUIZ 2 (p. 298) 1. $5 + 16i$ 2. $-4 + 10i$ 3. $31 + 22i$

4. $\frac{1}{13} - \frac{8}{13}i$ 5. -10.

5. $2\sqrt{5}$ 6. 5

7. $\sqrt{10}$ 8. 5

9. 4 10. $\frac{\sqrt{58}}{2}$



11. $-4 + \sqrt{2}$, $-4 - \sqrt{2}$ 12. $1 + 4i$, $1 - 4i$ 13. $5 + 3\sqrt{3}$, $5 - 3\sqrt{3}$

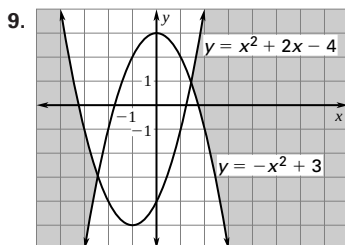
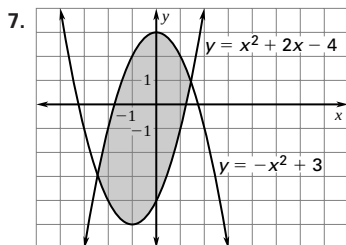
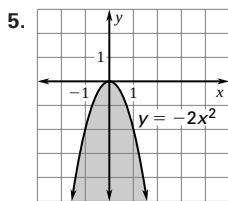
14. $-2 + \frac{\sqrt{5}}{5}$, $-2 - \frac{\sqrt{5}}{5}$ 15. $y = (x + 3)^2 - 8$

16. $y = (x - 9)^2 - 31$ 17. $y = -2(x - 2)^2 + 1$ 18. $-1 + \sqrt{11}$, $-1 - \sqrt{11}$

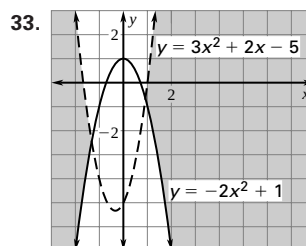
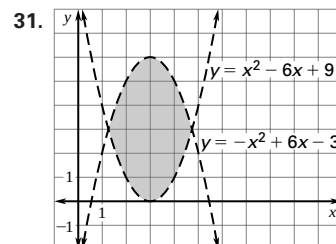
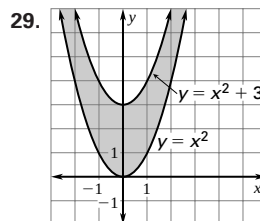
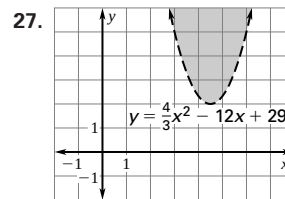
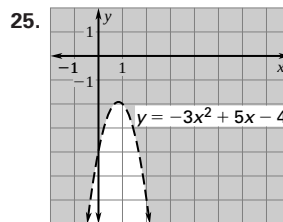
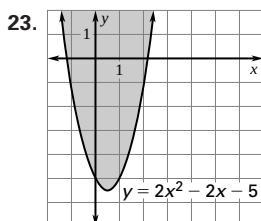
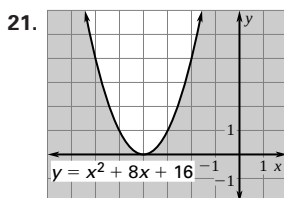
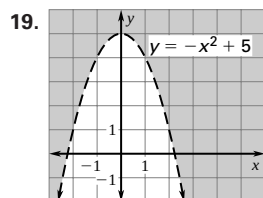
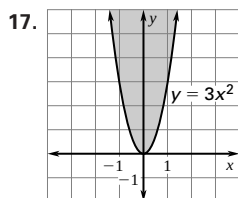
19. $8 + 3i$, $8 - 3i$ 20. $\frac{3 + i\sqrt{7}}{2}$, $\frac{3 - i\sqrt{7}}{2}$

21. $\frac{-4 + 2\sqrt{6}}{5}$, $\frac{-4 - 2\sqrt{6}}{5}$ 22. about 1 sec

5.7 PRACTICE (pp. 303–305)

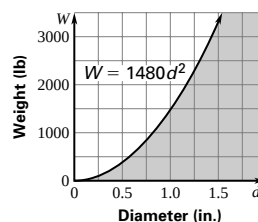


11. $x \leq -2$ or $x \geq 2$
13. about 55.1 m and 447.3 m 15. C

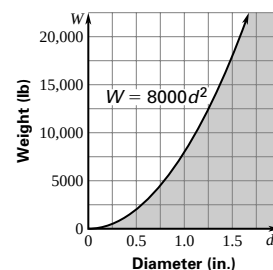


35. $-2 < x < 1$
37. $x \leq -4$ or $x \geq 2$
39. $x \leq -5.5$ or $x \geq -2.5$
41. $x \leq -6$ or $x \geq 3$
43. $-\frac{5}{2} < x < \frac{5}{2}$
45. $x < -0.9$ or $x > 2.9$

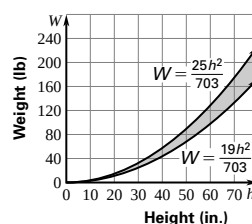
47. Weight for Manila Rope



Weight for Wire Rope



49. Healthy Weights



51. about 39 to 61 years old

5.7 MIXED REVIEW (p. 305) 55. $y = 4x - 5$ 57. $y = -\frac{11}{4} - \frac{1}{2}x$

59. $y = -9x$ 61. (2, 3, -4) 63. -6 65. $6 - 5i$ 67. $29 - 29i$

69. $\frac{6}{17} - \frac{7}{17}i$

5.8 PRACTICE (pp. 309–311) 3. $y = -1(x - 1)^2 + 3$

5. $y = x^2 + 3x - 2$ 7. $y = (x - 2)^2 - 2$ 9. $y = -\frac{3}{4}(x - 1)^2$

11. $y = \frac{1}{3}(x + 4)^2 + 6$ 13. $y = -3x^2$ 15. $y = -\frac{3}{2}(x + 6)^2 - 7$

17. $y = 3(x + 2)(x - 1)$ 19. $y = -1(x - 1)(x - 4)$

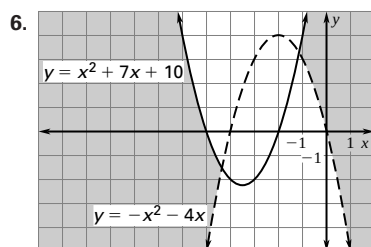
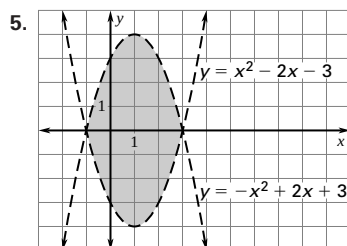
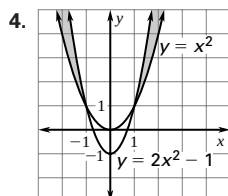
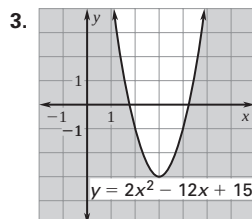
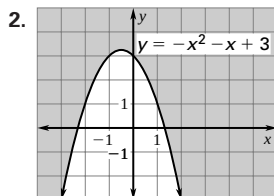
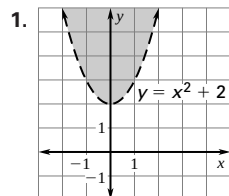
21. $y = 2(x + 1)(x - 6)$ 23. $y = \frac{7}{5}(x - 3)(x - 9)$

25. $y = -x^2 + x + 4$ 27. $y = -\frac{3}{4}x^2 - \frac{11}{4}x + 1$
 29. $y = -x^2 + 5x - 2$ 31. $y = -2x^2 - 4x + 9$
 33. $y = \frac{5}{2}x^2 + 6x - 8$ 35. $y = -0.00168(x - 0)(x - 24)$
 37. $s = -0.0807p^2 + 55.2p + 330$
 $k = -0.0000609p^2 + 0.626p + 125$

5.8 MIXED REVIEW (p. 312)

41. 5 43. -182 45. (3, -1) 47. (-4, 5)

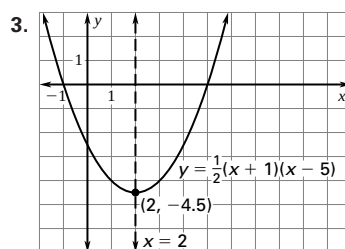
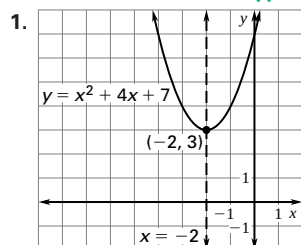
QUIZ 3 (p. 312)



7. $y = 2(x - 5)^2 - 2$
 8. $y = -1(x + 3)(x - 1)$
 9. $y = \frac{3}{4}x^2 + x$

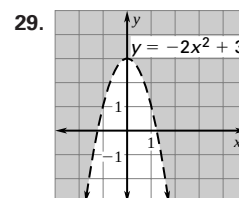
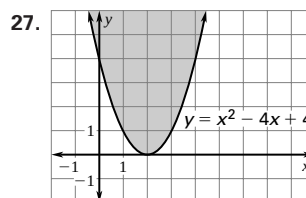
10. $0.00339N^2 + 0.00143N - 5.95 < 1000$; $0 < N < 544$

CHAPTER 5 REVIEW (pp. 314-316)



5. 4 7. $-3, \frac{5}{3}$
 9. -10, 10
 11. $-6 - 2\sqrt{10}$, $-6 + 2\sqrt{10}$
 13. $5 + i$ 15. $102 + 13i$
 17. $3\sqrt{13}$ 19. $5 + i, 5 - i$
 21. $y = (x - 4)^2 + 1$; (4, 1)

23. $y = 4(x + 2)^2 + 7$; (-2, 7) 25. $-\frac{7}{18} - \frac{\sqrt{85}}{18}$, $-\frac{7}{18} + \frac{\sqrt{85}}{18}$



31. $x \leq \frac{-7 - \sqrt{33}}{4}$ or $x \geq \frac{-7 + \sqrt{33}}{4}$ 33. $y = (x - 6)^2 + 1$

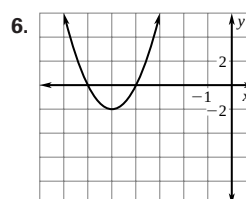
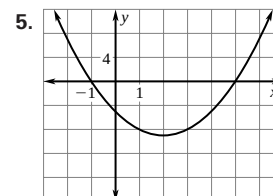
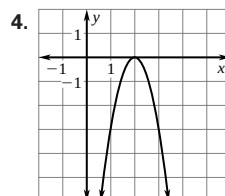
35. $y = 0.5x^2 + 1.5x - 4$

CHAPTER 6

SKILL REVIEW (p. 322)

1. $3x^2 - x$ 2. $-3x + 10$

3. $-5x^4 - 4x^3 + 7x^2$



7. $y = x^2 - 2x - 6$
 8. $y = 2x^2 + 16x + 32$
 9. $y = -x^2 - 6x + 16$
 10. -9, 3 11. -10 12. $-4, \frac{3}{2}$

6.1 PRACTICE (pp. 326-328)

3. 216 5. 64 7. $\frac{25}{9}$ 9. 1

11. $\frac{1}{16x^6}$ 13. $3y^3$ 15. sun's volume: $1.41 \times 10^{18} \text{ km}^3$;

Earth's volume: $1.09 \times 10^{12} \text{ km}^3$; ratio is about 1,298,000;

the results match. 17. $\frac{1}{15,625}$ 19. 262,144 21. $\frac{27}{343}$

23. $\frac{1}{121}$ 25. 4096 27. 2048 29. $\frac{1}{6}$ 31. $\frac{15,625}{64}$

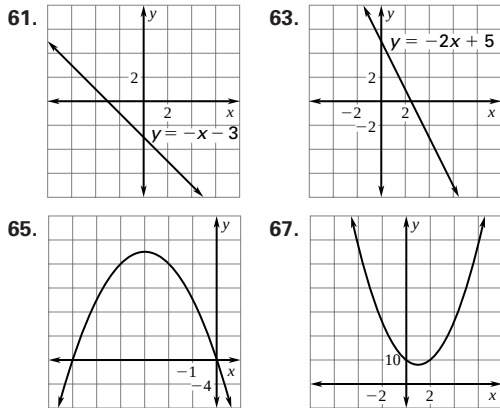
33. $32,768x^{10}$ 35. x^7 37. $\frac{1}{x^{12}y^{21}}$ 39. $-\frac{3}{x^4}$ 41. $\frac{y^3}{x^2}$

43. $\frac{1}{3}xy^2$ 45. $-\frac{y^{12}}{9x^4}$ 47. $3x^2y^2$ 49. $A = 16\pi x^2$

51. $V = \frac{4}{81}\pi x^3$

53.	Country	Per capita GDP	55. about 7.48×10^3 days
	France	$\$2.13 \times 10^4$	
	Germany	$\$2.24 \times 10^4$	
	Ireland	$\$1.95 \times 10^4$	
	Luxembourg	$\$3.24 \times 10^4$	
	The Netherlands	$\$2.14 \times 10^4$	
	Sweden	$\$2.00 \times 10^4$	

6.1 MIXED REVIEW (p. 328)



69. ± 4 71. $\pm \frac{4}{5}$ 73. ± 1 75. $\pm \sqrt{5}$ 77. $\pm \sqrt{3}$ 79. $-3 + 4i$
 81. $2 - 7i$ 83. $26 + 12i$

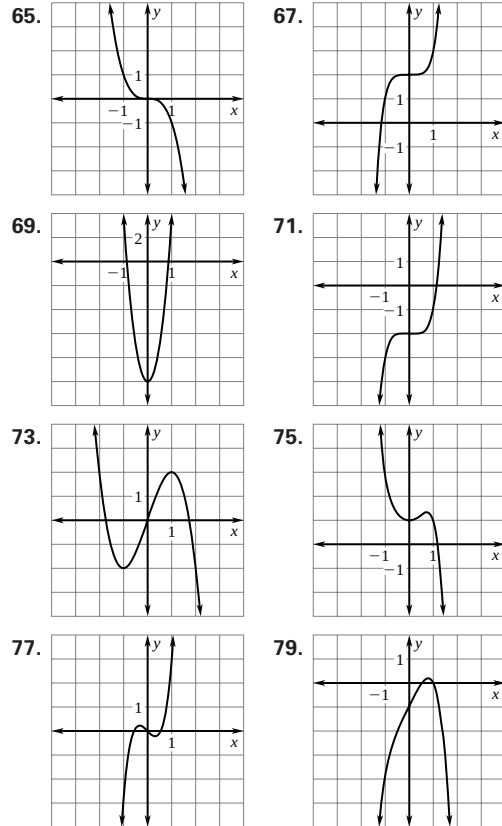
6.2 PRACTICE (pp. 333–336)

5. no 7. yes; -2
 9. $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$ and $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
 11. $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$ and $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
 13. $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$ and $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
 15. yes; $f(x) = -5x + 12$, 1, linear, -5 17. yes;
 $f(x) = x + \pi$, 1, linear, 1 19. no 21. yes; $f(x) = x^2 - x + 1$,
 2, quadratic, 1 23. yes; $f(x) = x^4 - x^3 + 36x^2$, 4, quartic, 1
 25. yes; $f(x) = 3x^3$, 3, cubic, 3 27. 4 29. 36 31. 4 33. 2
 35. 7930 37. 73 39. -91 41. -31 43. -7 45. 255

Function	As $x \rightarrow -\infty$	As $x \rightarrow +\infty$
$f(x) = -5x^3$	$f(x) \rightarrow +\infty$	$f(x) \rightarrow -\infty$
$f(x) = -x^3 + 1$	$f(x) \rightarrow +\infty$	$f(x) \rightarrow -\infty$
$f(x) = 2x - 3x^3$	$f(x) \rightarrow +\infty$	$f(x) \rightarrow -\infty$
$f(x) = 2x^2 - x^3$	$f(x) \rightarrow +\infty$	$f(x) \rightarrow -\infty$

49. C 51. B

53. $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$ and $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
 55. $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$ and $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
 57. $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$ and $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
 59. $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$ and $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
 61. $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$ and $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
 63. $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$ and $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$



81. about 4272.9 million ft² 83. $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$ and $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$; less; the graph will tend to go down over time.
 85. $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$ and $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$; more; the graph will tend to go up over time.

6.2 MIXED REVIEW (p. 336) 91. $7x$ 93. $x^2 + 4x - 11$
 95. $-x^2 - x + 2$ 97. $y = -2x^2 - 2x + 60$ 99. $y = 4x^2 - 24x + 12$ 101. $y = -3x^2 + 30x - 72$ 103. $\pm \sqrt{5}i$ 105. $\pm \sqrt{3}i$
 107. $\pm \frac{\sqrt{6}}{6}i$ 109. $\pm \frac{\sqrt{10}}{2}i$

TECHNOLOGY ACTIVITY 6.2 (p. 337)

- 1–7. Ranges may vary.
 1. $-10 \leq x \leq 10$, $-10 \leq y \leq 100$ 3. $-5 \leq x \leq 5$, $-5 \leq y \leq 10$
 5. $-5 \leq x \leq 5$, $0 \leq y \leq 20$ 7. $0 \leq x \leq 16$, $0 \leq y \leq 300,000$

6.3 PRACTICE (pp. 341–343) 5. $2x^3 - 5x^2 - 3x + 6$
 7. $-2x^2 + 4x - 2$ 9. $4x^4 + 10x^3 + 27x^2 - 41x - 70$
 11. $-27x^3 + 27x^2 - 9x + 1$ 13. $11x^2 - 1$ 15. $-7x + 7$
 17. $-8x^3 - 4x^2 + x - 4$ 19. $4x^2 - 6x - 21$ 21. $-7x^3 - x^2 + 2x - 11$ 23. $9x^3 - 3x^2 + 3x - 1$ 25. $x^3 + 7x^2 + 8x + 14$
 27. $x^3 + 6x^2 - 7x$ 29. $-4x^3 + 32x^2 - 12x$ 31. $x^2 - 11x + 28$
 33. $x^3 - x^2 - 3x + 27$ 35. $6x^4 + 13x^3 - 3x^2 + 5x$
 37. $x^3 + 6x^2 - 46x + 99$ 39. $x^4 + x^3 - 2x^2 + 2x - 2$
 41. $3x^4 + 12x^3 + 7x^2 - 8x - 6$ 43. $2x^4 + x^3 + 8x^2 - 3x + 4$
 45. $x^3 - 67x + 126$ 47. $-x^3 - 11x^2 - 23x + 35$
 49. $3x^3 - 31x^2 + 32x + 36$ 51. $6x^3 + 29x^2 + 21x + 4$
 53. $x^2 - 49$ 55. $64x^3 - 144x^2 + 108x - 27$ 57. $x^4 - 12x^2 + 36$
 59. $27x^3 + 189x^2 + 441x + 343$ 61. $8x^3 + 36x^2y + 54xy^2 + 27y^3$ 63. $V = 2x^3 + 5x^2 + 3x$

65. $y = -0.8246t^4 + 27.57t^3 - 268.42t^2 + 2797t + 219,260$; about 252 million people 67. $W = -0.0004128t^5 - 0.03414t^4 + 1.3539t^3 - 12.8387t^2 + 51.9t + 833$; about 1,086,000 degrees 69. $4000(1+r)^3 + 5000(1+r)^2 + 7000(1+r)$; $10,000r^3 + 43,000r^2 + 72,000r + 39,000$

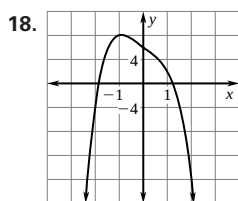
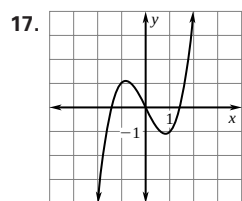
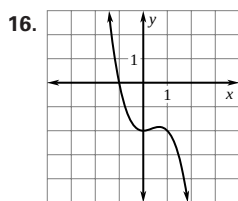
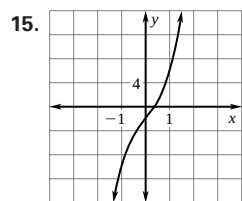
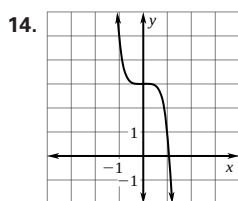
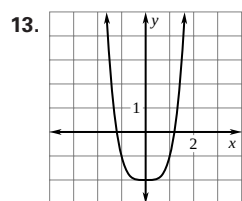
6.3 MIXED REVIEW (p. 344) 73. ± 3 75. -8 77. $-\frac{3}{2}, 5$

79. $y = -\frac{6}{5}x^2 - \frac{12}{5}x + \frac{48}{5}$ 81. $y = \frac{1}{3}x^2 - 12$ 83. x^3

85. $-\frac{1}{25}$ 87. $\frac{1}{2}x^4y^{11}$

QUIZ 1 (p. 344) 1. $\frac{1}{125}$ 2. $\frac{81}{16}$ 3. $\frac{25}{81}$ 4. $\frac{1}{16}$ 5. 1 6. $\frac{1}{648}$

7. $\frac{1}{25}$ 8. $\frac{1}{9x^6y^{12}}$ 9. $\frac{x^7}{y^3}$ 10. $\frac{x^3}{y}$ 11. $\frac{y^6}{8x^3}$ 12. $\frac{x^7}{y^7}$



19. $7x^3 + 3x^2 + 7x - 3$ 20. $3x^2 + 3x - 11$ 21. $2x^2 + 18x - 2$
22. $x^3 + 3x^2 + 2x - 6$ 23. $4x^3 + 19x^2 - 6x - 5$ 24. $2x^3 + 3x^2 - 17x - 30$ 25. $x^3 - 18x^2 + 108x - 216$ 26. $4x^4 + 12x^2 + 9$ 27. about 1.98×10^4 hours (about 825 days)

6.4 PRACTICE (pp. 348–350) 5. $(x^2 + 5)(x^4 - 5x^2 + 25)$

7. $(x + 1)(x - 1)(x^2 + 1)$ 9. $5(x - 4)(x^2 + 4x + 16)$ 11. 3

13. $-2, \pm 3$ 15. $\pm \frac{\sqrt{6}}{3}$ 17. 1998 19. $3x^3$ 21. $6x$ 23. 1

25. $3x^3$ 27. C 29. F 31. E 33. $(x - 2)(x^2 + 2x + 4)$

35. $(6x + 1)(36x^2 - 6x + 1)$ 37. $(10x + 3)(100x^2 - 30x + 9)$

39. $4(2x - 1)(4x^2 + 2x + 1)$ 41. $(x + 1)(x^2 + 1)$

43. $(x + 3)(x^2 + 10)$ 45. $(2x - 5)(x^2 + 9)$ 47. $(x - 2)(3x^2 + 1)$

49. $(3x - 2)(x^2 - 3)$ 51. $(x^2 + 1)(x^2 + 2)$

53. $(3x - 4)(3x + 4)(9x^2 + 16)$ 55. $(x^2 + 2)(x^2 + 8)$

57. $2x^2(2x - 1)(2x + 1)(4x^2 + 1)$ 59. $(2x^2 + 3)(9x - 1)$

61. $(2x + 1)(2x - 1)(x^2 + 10)$ 63. $8(x - 2)(x^2 + 2x + 4)$

65. $3x(x - 2)(x^2 + 2x + 4)$ 67. $x(3x^2 + 1)(x + 3)$ 69. 0, 3

71. -3 73. $-7, 2$ 75. 0, ± 3 77. $\frac{1}{2}$ 79. 5 81. ± 1 83. none

85. 0, $\pm 2, \pm \sqrt{2}$ 87. about 3.16 in. by 1.16 in. by 8.16 in.

89. 6 ft by 3 ft by 1 ft 91. base: 5 ft by 5 ft, height: 30 ft

6.4 MIXED REVIEW (p. 351) 99. $\frac{y^{11}}{6}$ 101. y^4 103. 481

6.5 PRACTICE (pp. 356–358) 5. $x^2 + x - 4 + \frac{14}{x+4}$

7. $-x + 2 + \frac{-3x+5}{x^2-1}$ 9. $x^3 - 4x^2 + 1$ 11. $x + 9 + \frac{16}{x-2}$

13. $-2, -1$ 15. $x + 9 + \frac{13}{x-2}$ 17. $2x - 5 + \frac{19}{x+4}$

19. $x + 15 + \frac{147}{x-10}$ 21. $2x^2 + 2 + \frac{9}{x^2-1}$ 23. $3x - 4 + \frac{5}{2x+3}$

25. $5x^2 - x + 3$ 27. $x^2 + 2x - 3 - \frac{12}{x-2}$ 29. $4x + 1 - \frac{5}{x+1}$

31. $2x + 11 + \frac{30}{x-2}$ 33. $x - 4 + \frac{26}{x+4}$ 35. $10x^3 - 5x^2 + 9x - 9$

37. $2x^3 + x - \frac{3}{x-3}$ 39. $(x + 2)(x - 3)(x - 4)$

41. $(x - 10)(x - 4)(x + 2)$ 43. $(x + 5)(x - 3)^2$

45. $(x - 1)(2x + 3)(2x - 3)$ 47. $-\frac{1}{9}, 1$ 49. $-5, -\frac{1}{2}$

51. $\frac{5 \pm \sqrt{17}}{2}$ 53. $1 \pm i\sqrt{7}$ 55. $3x - 10$ 57. $(-2, 6), (-1, 5),$

$(1, -3)$ 59. $5x^3 - 3x^2 + 21x - 8$; I multiplied $5x^2 - 13x + 47$ by $x + 2$ and added -102 . 61. Answers may vary depending

on rounding. $C = 0.0031x^2 + 0.1578x + 11.155 + \frac{6398}{8.4x - 580}$; about 144 million cars

6.5 MIXED REVIEW (p. 358) 67. Both are solutions.

69. $(1, 4)$ is a solution, but $(2, 0)$ is not a solution.

71. $4 \pm \sqrt{13}$ 73. $\frac{7 \pm \sqrt{33}}{8}$ 75. $\frac{-1 \pm \sqrt{41}}{10}$ 77. $\frac{-1 \pm i\sqrt{159}}{10}$

79. $-4x + 9$ 81. $-14x^3 - 2x^2 + x + 4$ 83. 82 guests

6.6 PRACTICE (pp. 362–364) 5. $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 8, \pm 9,$

$\pm 12, \pm 18, \pm 24, \pm 36, \pm 72$ 7. $\pm 1, \pm 2, \pm 5, \pm 10, \pm \frac{1}{5}, \pm \frac{2}{5}$

9. $-4, -1, 1$ 11. $-3, \frac{3}{2}, 2$ 13. $-5, -1, 1$ 15. $\pm 1, \pm 2, \pm 3,$

$\pm 4, \pm 6, \pm 8, \pm 12, \pm 24$ 17. $\pm \frac{1}{2}, \pm 1, \pm 2, \pm 4, \pm 8, \pm 16$

19. $\pm 1, \pm 2, \pm 5, \pm 10, \pm \frac{1}{2}, \pm \frac{5}{2}, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{5}{3}, \pm \frac{10}{3}, \pm \frac{1}{6}, \pm \frac{5}{6}$

21. $\pm 1, \pm 3, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{1}{4}, \pm \frac{3}{4}, \pm \frac{1}{8}, \pm \frac{3}{8}$ 23. $-2, 2$ 25. $-2, -1$

27. $-1, 1$ 29. none 31. $-2, -1, 1, 2$ 33. $-3, 1, 10$

35. $-2, 4, 5$ 37. $-4, 3, 6$ 39. $-1, 2$ 41. $-3, -2, 1, 3$

43. $-3, -2, 3$ 45. $-1, \frac{3}{2}, \frac{5}{2}$ 47. $-2, -1, 1$ 49. $-1, \frac{3}{2}, 2$

51. $-4, \frac{1}{2}, 4$ 53. $-\frac{5}{2}, 1$ 55. $-1, 1$ 57. $-2, -\frac{1}{2}, 2$ 59. 1993

61. 2 in. by 2 in. by 5 in. 63. 5 ft deep, 10 ft wide, 40 ft long

6.6 MIXED REVIEW (p. 365) 71. 3 73. 1 75. 10

77. $y = -\frac{5}{9}(x + 3)(x - 3)$ 79. $y = -2(x + 1)(x - 5)$

81. $y = -\frac{1}{63}(x + 12)(x + 6)$ 83. $y = -\frac{1}{3}(x - 4)(x - 10)$

85. $y = (x + 1)(x + 9)$

QUIZ 2 (p. 365) 1. $5(x + 3)(x^2 - 3x + 9)$ 2. $6(x + 2)(x^2 + 2)$

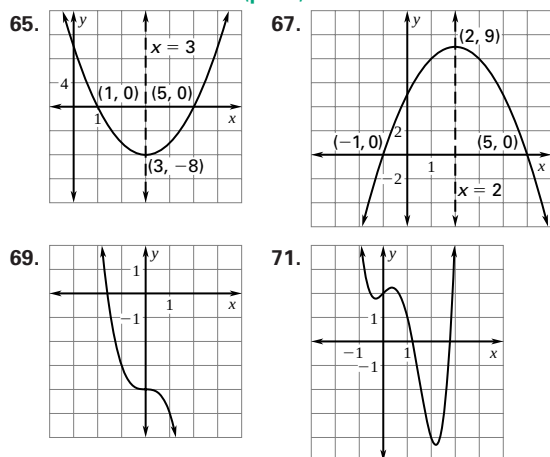
3. $4x(x^2 + 2)(x^2 - 2)$ 4. $(x^2 - 5)(3x - 1)$ 5. 0, ± 6 6. 0, $\frac{3}{2}$

7. 0, 3 8. $-\frac{5}{2}, -2, 2$ 9. $x + 11$ 10. $x - \frac{10}{3} + \frac{80}{3(3x + 2)}$

11. $4x - 7 + \frac{11x - 11}{x^2 - 3}$ 12. $12x^3 - 7x^2 + 10x - 10 + \frac{5}{x + 1}$
 13. $x + \frac{2x^2 + 6x + 6}{x^3 - 3}$ 14. $5x^3 - 23x^2 + 115x - 576 + \frac{2875}{x + 5}$
 15. $\pm\sqrt{7}$, 4 16. 2 17. $-5, -3, \frac{1}{2}$ 18. $-6, \frac{1}{2}, 2$
 19. 16 ft by 16 ft by 0.5 ft

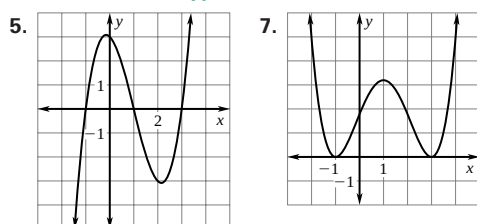
6.7 PRACTICE (pp. 369–371) 5. $\pm\sqrt{3}, \pm 2i$ 7. $-1, 2, \pm 2i$
 9. $f(x) = x^4 - 2x^3 + 2x^2 - 2x + 1$ 11. $f(x) = x^5 - 3x^4 - 5x^3 + 15x^2 + 4x - 12$ 13. $f(x) = x^4 + 32x^2 + 256$ 15. yes
 17. no 19. yes 21. $-3, -2, -1, 1$ 23. 0, 1, 3 25. $-5, -4, -1, 3$ 27. 1, $\pm 7i$ 29. $-5, -1, \pm 3i$ 31. $-2, 3, \pm i$ 33. $-3, -1, 3, 4.5$ 35. $f(x) = x^3 - 7x^2 + 14x - 8$ 37. $f(x) = x^3 - 2x^2 - 33x + 90$ 39. $f(x) = x^3 + 13x^2 + 50x + 56$ 41. $f(x) = x^3 - 5x^2 + 9x - 45$ 43. $f(x) = x^4 + 10x^2 + 9$ 45. $f(x) = x^4 - 12x^3 + 53x^2 - 104x + 80$ 47. $-2.09, 0.57, 2.51$ 49. -0.47
 51. $-1.27, 2.86$ 53. $-0.75, 0.75$ 55. 1988 57. Yes; there were 2 such years, 1988 and 1993, because the graph intersects the line $S = 2000$ when t is about 1.6 and when t is about 6.3. 59. 1965

6.7 MIXED REVIEW (p. 371)

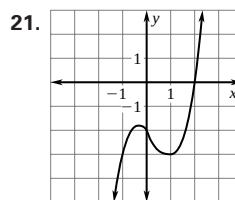
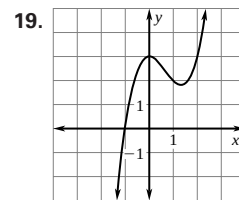
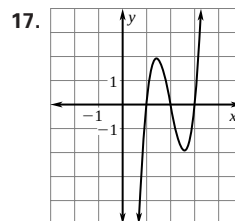
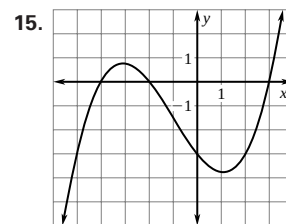
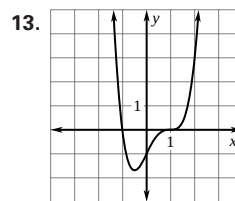


TECHNOLOGY ACTIVITY 6.7 (p. 372) 1. $-0.640, 1.135, 5.505$ 3. 5. $-2.334, -0.742, 0.742, 2.334$
 7. $-1.088, -0.668, 1.191$ 9. $-7.349, 16.429, 30.921$; yes

6.8 PRACTICE (pp. 376–378)



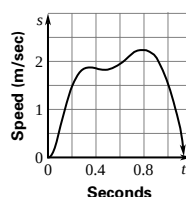
9. x-intercepts: $-0.41, 1, 2.41$; local maximum: $(0.18, 1.09)$; local minimum: $(1.82, -1.09)$ 11. x-intercepts: 0, 1, 1.51; local maximums: $(-1.59, -3.23), (0.49, 1.35)$; local minimums: $(-1, -4), (1.30, -0.79)$



23. $(-0.5, 0.5)$ max, $(0.5, -0.3)$ min; $-0.9, 0, 0.6, 3$
 25. $(-2, 1)$ min, $(0, 2)$ max; 1.4; 3
 27. $(-2, -1)$ max, $(0, -2.2)$ min, $(1, -2)$ max; none; 4

29. x-intercepts: $-1.79, 0.11, 1.67$; local maximum: $(-1, 7)$; local minimum: $(1, -5)$ 31. x-intercepts: $-2.83, 0, 2.83$; local maximums: $(-2, 4), (2, 4)$; local minimum: $(0, 0)$
 33. x-intercepts: $-2, -1, 0, 1, 2$; local maximums: $(-1.64, 3.63), (0.54, 1.42)$; local minimums: $(-0.54, -1.42), (1.64, -3.63)$

35. **Speed of Swimmer** ; at about $t = 0.8$ sec into the stroke



37. $l = \frac{600 - \pi r^2}{\pi r}$

39. 1600 ft^3 ; $r \approx 7.98 \text{ ft}$, $l \approx 15.97 \text{ ft}$, or about 16 ft long, 16 ft wide, and 8 ft high

6.8 MIXED REVIEW (p. 378) 45. $y = 7x$ 47. $y = \frac{1}{4}x$

49. $y = -\frac{3}{5}x$ 51. yes; 4×1 53. no 55. $y = -(x - 1)^2 + 4$

57. $y = \frac{5}{24}(x + 5)(x - 5)$ 59. 10 in./day

6.9 PRACTICE (pp. 383–385)

5. $f(1) f(2) f(3) f(4) f(5) f(6)$
 4 17 40 73 116 169 Values
 13 23 33 43 53 First-order differences
 10 10 10 10 Second-order differences

7. $f(1) f(2) f(3) f(4) f(5) f(6)$
 3 20 87 264 635 1308 Values
 17 67 177 371 673 First-order differences
 50 110 194 302 Second-order differences
 60 84 108 Third-order differences
 24 24 Fourth-order differences

9. 3 11. $f(x) = -x^3 + 5x^2 + x + 1$ 13. $d(n) = \frac{1}{2}n^2 - \frac{3}{2}n$

15. $f(x) = -\frac{1}{2}(x + 1)(x - 2)(x - 3)$ 17. $f(x) = -\frac{1}{2}x(x + 1)(x + 2)$

19. $f(x) = -\frac{1}{4}(x-1)(x-3)(x+2)$

21. $f(x) = (x-3)(x-2)(x+1)$

23. $f(1) f(2) f(3) f(4) f(5) f(6)$

5	5	7	11	17	25	Values
0	2	4	6	8		First-order differences
2	2	2	2			Second-order differences

25. $f(1) f(2) f(3) f(4) f(5) f(6)$

-3	-3	-9	-27	-63	-123	Values
0	-6	-18	-36	-60		First-order differences
-6	-12	-18	-24			Second-order differences
-6	-6	-6				Third-order differences

27. $f(1) f(2) f(3) f(4) f(5) f(6)$

-18	-8	102	432	1150	2472	Values
10	110	330	718	1322		First-order differences
100	220	388	604			Second-order differences
120	168	216				Third-order differences
48	48					Fourth-order differences

29. $f(1) f(2) f(3) f(4) f(5) f(6)$

4	4	-36	-176	-500	-1116	Values
0	-40	-140	-324	-616		First-order differences
-40	-100	-184	-292			Second-order differences
-60	-84	-108				Third-order differences
-24	-24					Fourth-order differences

31. $f(1) f(2) f(3) f(4) f(5) f(6)$

3	-2	-13	-30	-53	-82	Values
-5	-11	-17	-23	-29		First-order differences
-6	-6	-6	-6			Second-order differences

33. $f(x) = -3x^2 + 20x$ 35. $f(x) = x^3 - 4x^2 + x$
 37. $f(x) = x^3 + 4x^2 - x - 2$ 39. $y = 2x^3 - 16x^2 + 37x - 25$
 41. $f(x) = -x^3 + 10x^2 - 30x + 23$ 43. $f(x) = -x^4 + 13x^3 - 58x^2 + 104x - 58$ 47. $f(t) = 0.641t^3 - 4.93t^2 + 25.8t + 232$
 where t is the number of years since 1989; 772,000 Girl Scouts
 49. $y = 0.007t^3 - 0.740t^2 + 49.0t - 236$; about 101 sec

6.9 MIXED REVIEW (p. 386) 53. $\pm \frac{1}{2}$ 55. $\pm \frac{\sqrt{78}}{6}$ 57. $\pm \frac{\sqrt{2}}{2}$

59. $-3 \pm \sqrt{33}$ 61. $-2 \pm \frac{i\sqrt{6}}{2}$ 63. $3 \pm \frac{i\sqrt{15}}{3}$

65. $(3x+2)(9x^2-6x+4)$ 67. $(2x-5)(4x^2+10x+25)$

69. $8(x+3)(x^2-3x+9)$ 71. $3(x+3)(x^2-3x+9)$

QUIZ 3 (p. 386) 1. -2.61, -0.74, 3.86 2. -2, $\frac{-1 \pm i\sqrt{3}}{2}$

3. -1, 4, $\pm i\sqrt{2}$ 4. $-\frac{3}{2}$, -1, 1, 2 5. $y = x^3 + 2x^2 - 4x - 8$

6. $y = x^3 + 2x^2 - 3x$ 7. $y = x^3 - 8x^2 + 21x - 20$

8. $y = x^4 - 7x^3 + 11x^2 - 7x + 10$ 9. $y = x^3 - 8x^2 + 29x - 52$

10. $y = x^4 - 6x^3 + 18x^2 - 24x + 16$

11. local max (0.79, 8.21), local min (-2.12, -4.06)

12. local max (-0.50, 0.56), local min (-1.62, -1), (0.62, -1)

13. local max (2.42, 0.77), local min (3.58, -0.77)

14. local max (-3, 0), local min (-1.67, -1.19) 15. $f(x) =$

$-\frac{1}{3}(x+2)(x+4)(x-2)$ 16. $f(x) = -\frac{1}{70}(x+1)(x-4)(x-2)$

17. $f(x) = x(x-3)(x-5)$ 18. $f(x) = 2(x-1)(x+3)(x+5)$

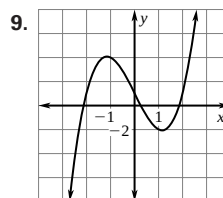
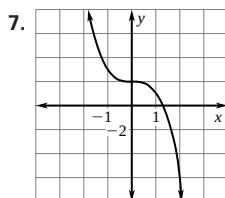
19. $f(x) = x^3 - 3x^2 + x - 4$ 20. $f(x) = x^3 - 4x^2 + 2x$

21. $N = -3.75x^3 + 50.9x^2 - 97.3x + 3210$ where x is the number of years since 1988

CHAPTER 6 REVIEW (pp. 388–390)

1. $\frac{96x^3}{y^3}$; negative exponent, power of a quotient, power of a product, and power of a power property

3. $-\frac{7}{2}x^3y^6$; quotient of powers property 5. 25



11. $x^3 - 2x^2 - 10x + 21$ 13. -4 15. -3, -1, 1

17. $x^2 + \frac{5}{2} + \frac{33}{2(2x-5)}$ 19. -2, 1

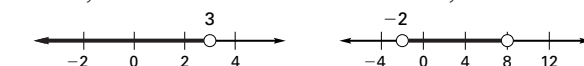
21. ; x-intercepts: 0, 3; local max: (0, 0); local min: (2, -4)

23. $f(1) f(2) f(3) f(4) f(5) f(6)$

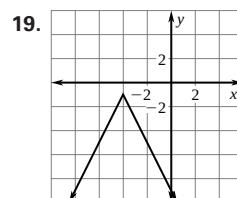
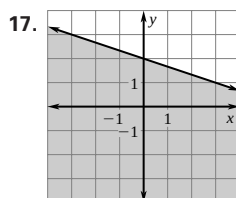
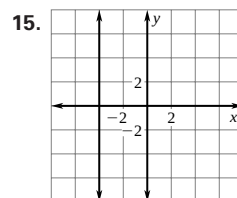
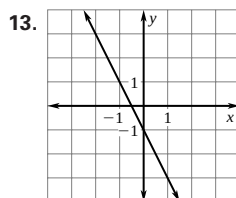
2	9	28	65	126	217	Values
7	19	37	61	91		First-order differences
12	18	24	30			Second-order differences
6	6	6				Third-order differences

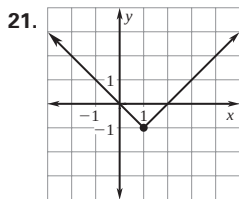
CUMULATIVE PRACTICE (pp. 394–395)

1. -5 3. -4, 8

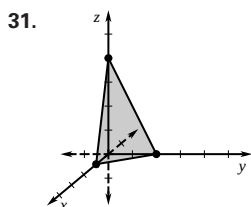


9. 0 11. 4





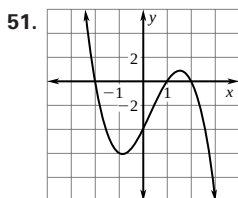
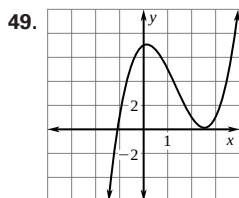
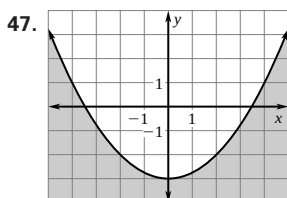
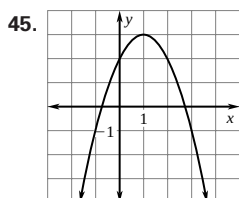
23. $y = -4x + 5$ 25. (3, 5)
27. (1, 0, 3)



33. $\begin{bmatrix} -11 & 8 \\ 1 & -2 \end{bmatrix}$ 35. $\begin{bmatrix} 17 & -7 & -27 \\ 3 & -9 & 69 \end{bmatrix}$

37. 3 39. -55 41. $\begin{bmatrix} 7 & 2 \\ -4 & -1 \end{bmatrix}$

43. no inverse



53. $\pm\sqrt{13}$ 55. $\pm 8i$ 57. $-10 \leq x \leq 10$ 59. $\pm 2, \pm 1$
61. $-2, \pm \frac{\sqrt{6}}{2}$ 63. $32 + 20i$ 65. $9 + 2i$ 67. $y = -(x+3)(x+2)$
69. $36x^2y^6$ 71. $\frac{16}{25}$ 73. $x^4 - 5x^3 + 11x^2 - 27x + 36$
75. $x^3 - 5x^2 + 18x - 36 + \frac{70}{x+2}$ 77. $\pm\sqrt{5}, \pm\sqrt{5}i$
79. $f(x) = (x+4)(x+1)(x-1)$ 81. $r = \frac{I}{Pt}, 5.5\%$
83. 8 min 85. about 5.45 h

CHAPTER 7

SKILL REVIEW (p. 400) 1. $y = \frac{3x-12}{2}$ 2. $y = 10 - 2x$

3. $y = \frac{x+1}{4}$ 4. $(x+7)(x+3)$ 5. $(x+9)(x-4)$

6. $2(x-3)(x-5)$ 7. $a^4b^4c^8$ 8. x^2 9. $\frac{x^4}{y^2}$ 10. $\frac{3x^3}{4y^6}$

11. $5x^3 - 40x^2$ 12. $9y^2 - 12y + 4$ 13. $7x^2 - 5x + 4$

7.1 PRACTICE (pp. 404–406) 5. -7 7. 25 9. -1 11. ± 10
13. $14^{1/4}$ 15. $5^{2/7}$ 17. $2^{11/8}$ 19. $\sqrt[4]{7}$ 21. $(\sqrt[5]{5})^2$ 23. ± 10
25. -2 27. none 29. 4 31. -2 33. 1 35. 4 37. 0
39. 16 41. -7 43. 4 45. 0.56 47. 0.0019 49. 1.82
51. 0.087 53. 3 55. 0 57. -1.69 59. -9.24 61. ± 1.40
63. 1247.73 ft³/sec 65. 1.58 ft 67. about 37 species

7.1 MIXED REVIEW (p. 406) 73. $x = 3, y = -4$ 75. $x = \frac{16}{5}$,
 $y = \frac{3}{10}$ 77. $x = \frac{13}{11}, y = -\frac{13}{11}$ 79. $\frac{1}{x^{15}}$; power of a power and

negative exponent properties 81. $\frac{5}{x^2}$; negative exponent and zero exponent properties

83. $\frac{1}{x^4y^2}$; negative exponent and power of a quotient properties 85. $4x^2y$; product of powers and quotient of powers properties 87. -1, 2, 3, -5 89. 1, $\pm 3i$

7.2 PRACTICE (pp. 411–413) 5. 3 7. 4 9. $\frac{2}{3}$ 11. $3\sqrt[7]{8}$

13. x^2 15. $2a^3$ 17. $\frac{x^2}{y}$ 19. $-4a^{1/5}$ 21. 1333.78 cm²

23. $5^{1/3}$ 25. 6 27. $5^{1/3}$ 29. $\frac{8}{5}$ 31. $5^{3/4}$ 33. $\frac{1}{64,000}$

35. 2 37. $6^7 = 279,936$ 39. $\frac{1}{2}$ 41. 3 43. $3\sqrt[5]{5}$ 45. $30\sqrt[4]{3}$

47. $\frac{2\sqrt[3]{3}}{3}$ 49. $\sqrt[15]{2}$ 51. $-2\sqrt[7]{5}$ 53. $3\sqrt{10}$ 55. $9\sqrt[4]{11}$

57. $y^{1/2}$ 59. $x^{5/4}$ 61. $\frac{x^3}{y}$ 63. $y^{5/3}$ 65. $\frac{x^{1/2}y}{z}$ 67. $\frac{1}{3y^2}$

69. $xy^2z^2\sqrt[4]{10xz^2}$ 71. $y^2z^2\sqrt{2xz}$ 73. $\frac{x\sqrt[3]{y}}{y}$ 75. $x^{1/35}$

77. $7x^{1/5}$ 79. $2x^3y^{1/3}$ 81. $(2x-1)y\sqrt[3]{3x^2}$ 83. y^2

85. $\frac{1}{4\sqrt[4]{7}}$ 87. $\frac{x}{y^2}$ 89. $-2xy\sqrt[11]{1}$ 91. $\frac{\sqrt[3]{3}}{2}$ 93. 0.45 mm

95. Higher notes have frequencies twice as high as lower notes of the same letter. 97. $2^{2/3}$

7.2 MIXED REVIEW (p. 414) 101. $\frac{441}{4}, \left(x - \frac{21}{2}\right)^2$

103. 24.5025, $(x+4.95)^2$ 105. $\frac{1}{64}, \left(x - \frac{1}{8}\right)^2$

107. $8x^3 + 9x^2 + 52x + 1$ 109. $4x^2 + 28x + 49$

111. $(4x-1) - \frac{2}{x+1}$ 113. $x^3 + 3x^2 + 15x + 5 + \frac{45}{x-5}$

QUIZ 1 (p. 414) 1. 4 2. $\frac{1}{8}$ 3. -3 4. 16 5. 1.58 6. ± 1.12

7. ± 1.90 8. -4.47 9. $4^{1/4}$ or $2^{1/2}$ 10. $\frac{2\sqrt[4]{27}}{3}$ 11. 4

12. $3\sqrt{5}$ 13. 7 14. $3\sqrt[5]{8}$ 15. $x^{11/12}$ 16. $x^{1/2}$ 17. $x^{1/4}y^{5/2}$

18. $xy\sqrt[3]{5y^2}$ 19. $\frac{6\sqrt[4]{xy}}{y^2}$ 20. $2xy^{1/2}$ 21. about 30,000

horsepower 22. No; The surface area of the Labrador retriever is about 2.08 times the surface area of the Scottish terrier.

7.3 PRACTICE (pp. 418–420) 5. $5x - 1$; all real numbers
7. $4x^2 - 4x$; all real numbers 9. $4x - 4$; all real numbers
11. $g(f(x))$; The bonus is 0.02 times the amount over \$200,000 ($x - 200,000$), so calculate amount first and then take 2%. 13. $2x^2 - 5x + 4$; all real numbers 15. $2x^2 - 8$; all real numbers 17. $5x - 12$; all real numbers 19. 0; all real numbers 21. $6x^{7/6}$; nonnegative real numbers

23. $9x$; nonnegative real numbers 25. $\frac{3}{2x^{1/6}}$; positive real

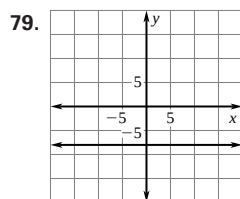
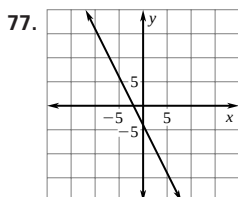
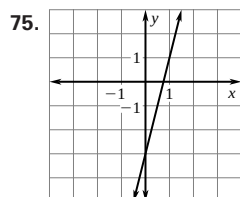
numbers 27. 1; positive real numbers 29. $2^{3/2}x^{-15/4}$; positive real numbers 31. $x^{9/16}$; nonnegative real numbers

33. $9x - 4$; all real numbers 35. $\frac{10x}{x+4}$; all real numbers

except -4 37. $10x + 4$; all real numbers 39. $x + 8$; all real numbers 41. $x^{1/2}$; nonnegative real numbers 43. $x^2 - x - 8$; all real numbers 45. $4x^3 - 16x^2$; all real numbers 47. $x - 5$; all real numbers except 0 49. $x^4 - 6x^2 + 10$; all real numbers 51. $81x - 20$; all real numbers 53. $r(w) = 220w^{-0.266}$; about 134 breaths per minute; about 18 breaths per minute; about 11 breaths per minute

7.3 MIXED REVIEW (p. 420)

69. $y = \frac{-2x-8}{3}$ 71. $y = \frac{5}{x}$ 73. $y = \frac{c-ax}{b}$



81. 3 83. $-6, -2$

7.4 PRACTICE (pp. 426–428)

5.

x	2	1	0	1	2
y	-4	-2	0	2	4

7. $y = \frac{x+1}{2}$

9. Both compositions equal x .

11. $\sqrt[4]{27x}$ 13. No; horizontal lines, such as $y = 0$, cross the

graph more than once. 15.

x	0	3	-2	2	-1
y	1	-2	4	2	-2

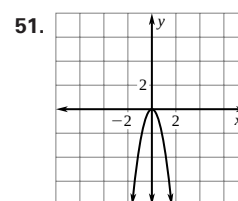
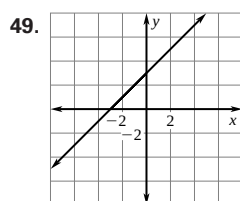
17. $y = \frac{x+3}{3}$

19. $y = -\frac{5}{4}(x-11)$ 21. $y = \frac{-x+7}{12}$ 23. $y = \frac{x+13}{8}$

33. A 35. B 37. $f^{-1}(x) = \sqrt[6]{-x}$ 39. $f^{-1}(x) = 2\sqrt[5]{x}$

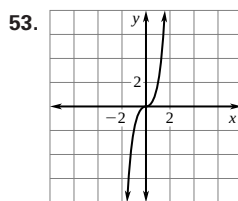
41. $f^{-1}(x) = -\frac{2}{3}\sqrt{-x}$ 43. $f^{-1}(x) = \sqrt[5]{-\frac{1}{2}x + \frac{1}{6}}$

45. $f^{-1}(x) = \sqrt[3]{\frac{5}{3}x + 15}$ 47. $f^{-1}(x) = \sqrt[5]{6x-4}$

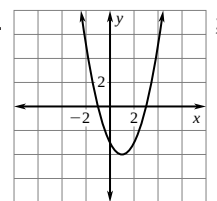


Yes, inverse is a function.

No, inverse is not a function.



Yes, inverse is a function.

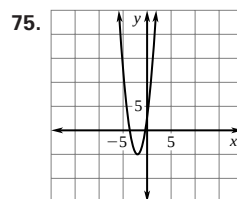
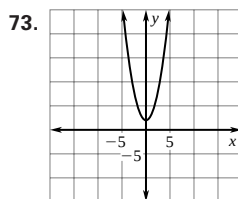
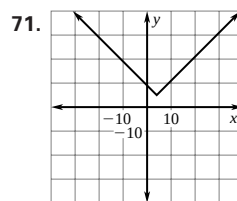
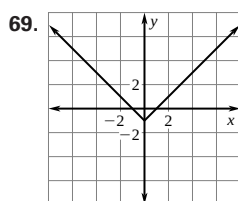


No, inverse is not a function.

57. $D_{US} = 0.65677D_C$ 59. $a = 200 - 1.11h$; 170

61. $l = \sqrt[3]{106723.59w}$; 41.69 cm

7.4 MIXED REVIEW (p. 429)



77. 2 79. $\frac{1}{5y}$ 81. $5\sqrt[7]{5}$ 83. \$.65

QUIZ 2 (p. 429)

1. $f(x) + g(x) = 6x^2 + x^{1/2}$; nonnegative real numbers

2. $f(x) - g(x) = 6x^2 - 3x^{1/2}$; nonnegative real numbers

3. $f(x) \cdot g(x) = 2x(6x^{3/2} - 1)$; nonnegative real numbers

4. $\frac{f(x)}{g(x)} = 3x^{3/2} - \frac{1}{2}$; positive real numbers

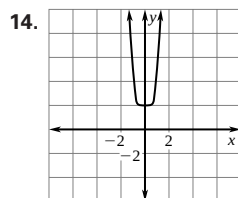
5. $f(g(x)) = \frac{3}{x-8}$; real numbers except 8

6. $g(f(x)) = \frac{3}{x} - 8$; real numbers except 0 7. $f(f(x)) = x$;

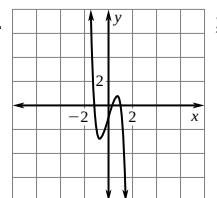
real numbers except 0 8. $g(g(x)) = x - 16$; all real numbers

9. Both compositions equal x . 10. Both compositions equal x .

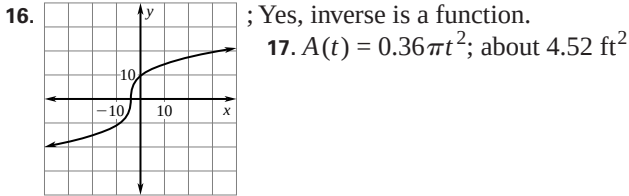
11. $f^{-1}(x) = x - 8$ 12. $f^{-1}(x) = \frac{-\sqrt[4]{8x}}{2}$ 13. $f^{-1}(x) = \sqrt[5]{6-x}$



No, inverse is not a function.

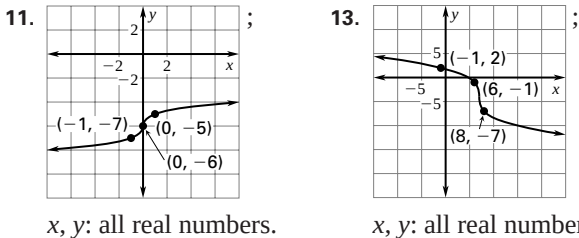
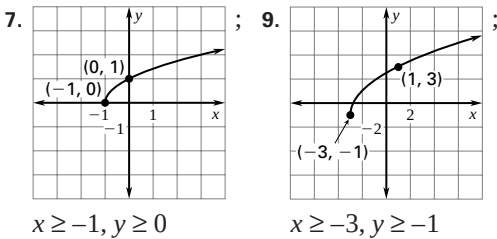


No, inverse is not a function.

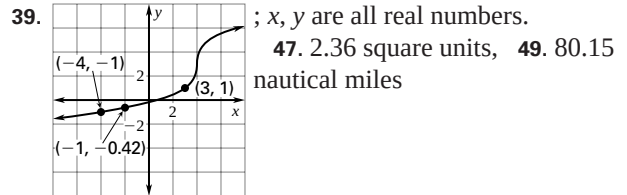
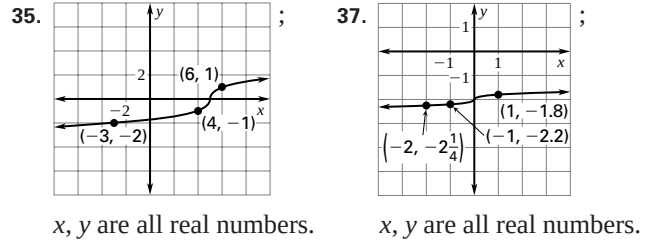
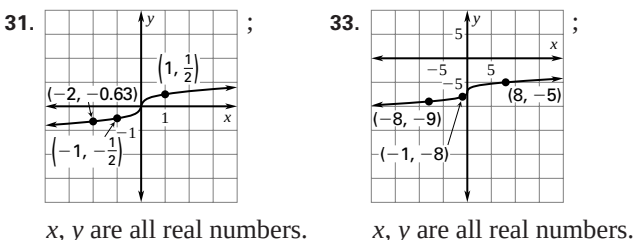
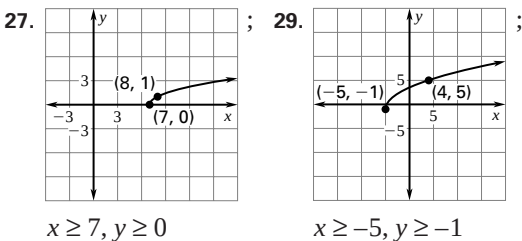
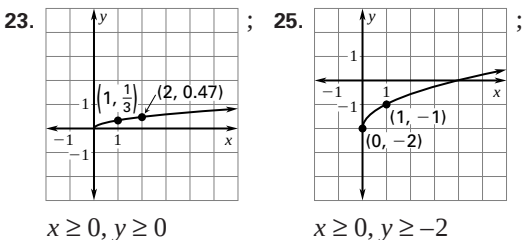


TECHNOLOGY ACTIVITY 7.4 (p. 430) 1. Yes; the inverse passes the vertical line test. 3. Yes; the inverse passes the vertical line test. 5. No; the inverse does not pass the vertical line test. 7. Yes; the inverse passes the vertical line test. 9. Yes; the inverse passes the vertical line test. 11. No; the inverse does not pass the vertical line test.

7.5 PRACTICE (pp. 434–436) 5. Shift the graph 10 units down.



15. Shift graph 14 units left. 17. Shift graph 10 units down.
 19. B 21. C

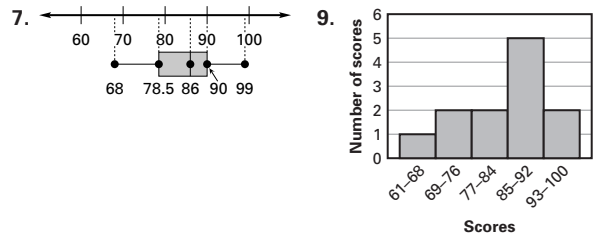


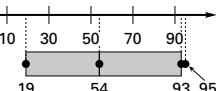
7.5 MIXED REVIEW (p. 436) 55. $\pm\sqrt{10} - 7$ 57. ± 6
 59. $\frac{\pm\sqrt{33}}{2} + \frac{1}{4}$ 61. $x^2 - 18xy + 81y^2$ 63. $9x^2 - 24xy^4 + 16y^8$ 65. $1 + 4x^2 + 4x^4$ 67. $f(g(x)) = 2x - 5$; $g(f(x)) = 2x - 2$ 69. $f(g(x)) = 9x^2 - 18x + 16$; $g(f(x)) = 3x^2 + 18$

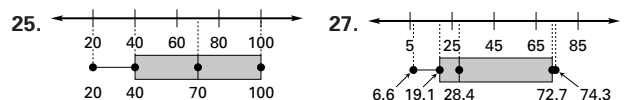
7.6 PRACTICE (pp. 441–443) 5. 1 7. 8 9. -5 11. $\frac{64}{3}$
 13. 2, 3 15. no solution 17. yes 19. yes 21. no 23. 4
 25. 27 27. 81 29. $\frac{11}{2}$ 31. $\frac{406}{81}$ 33. 216 35. 200
 37. no solution 39. $\frac{12}{7}$ 41. 36 43. $-\frac{2}{3}$ 45. 1, 3 47. 5
 49. $-\frac{1}{6}$ 51. no solution 53. 5 55. -18.96296 57. 0.10345
 59. 11.099 61. no solution 63. 0.146 in. 65. 1991
 67. 34.078 mi/h 69. 4.90

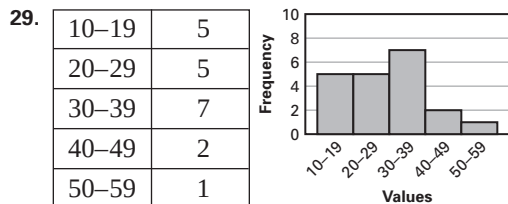
7.6 MIXED REVIEW (p. 444) 81. 20 83. -78 85. 19
 87. -0.95; no local maximums or minimums
 89. 0, ± 1.41 ; (-0.914, 4.08); (0.914, -4.08)

7.7 PRACTICE (pp. 449–451) 5. 31



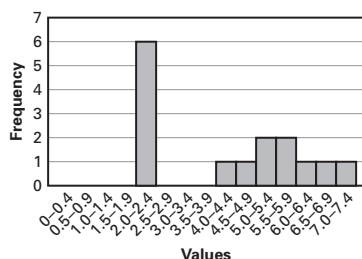
11. 49.57, 47, 47 13. about 249, 230, 230 15. 0.356; 0.3;
 0, 0.5 (two modes) 17. 8, 2.73 19. 417, 143
 21. 12.1, 3.82 23. 





31.

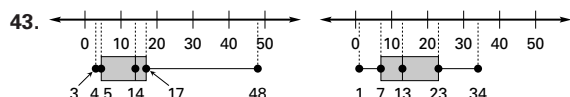
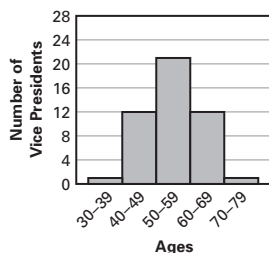
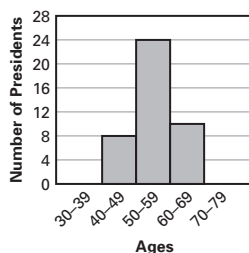
0–0.4	0	4.0–4.4	1
0.5–0.9	0	4.5–4.9	1
1.0–1.4	0	5.0–5.4	2
1.5–1.9	0	5.5–5.9	2
2.0–2.4	6	6.0–6.4	1
2.5–2.9	0	6.5–6.9	1
3.0–3.4	0	7.0–7.4	1
3.5–3.9	0		



33. machine 1: 2.59, 2.59, none; machine 2: 2.59, 2.59, none
 37. \$645,000; \$213,243.66 39. The mode is the most appropriate measure because it would indicate that most people have a positive opinion on the issue. Because the categories are not part of an ordered scale, means and medians are not meaningful.

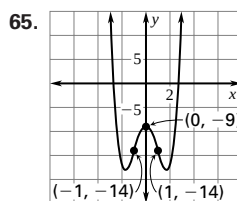
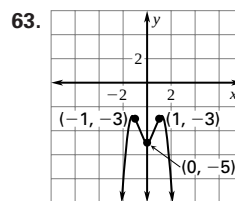
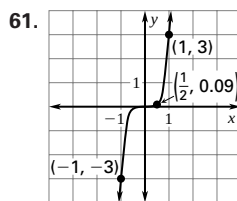
41.

Age	Pres	VP
30–39	0	1
40–49	8	12
50–59	24	21
60–69	10	12
70–79	0	1

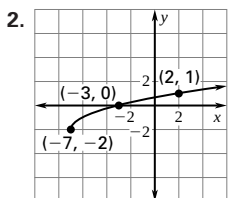
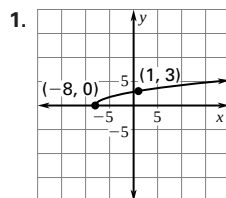


45. Sample answer: You cannot conclude that one conference consistently has larger (or smaller) margins of victory than the other.

7.7 MIXED REVIEW (p. 452) 51. 24 53. -326
 55. 2187; product of powers 57. $\frac{1}{4}$; product of powers,
 negative exponent 59. $\frac{1}{100}$; zero exponent; negative
 exponent

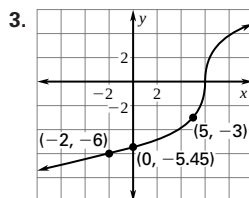


QUIZ 3 (p. 452)



$x \geq -8, y \geq 0$

$x \geq -7, y \geq -2$



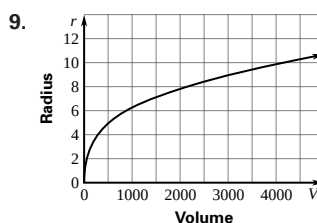
; x and y are all real numbers.

4. 312.5

5. 6 (-1 is an extraneous solution.)

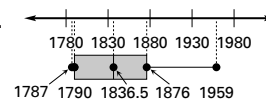
6. 0 7. 4.4, 5.5, 6, 9, 2.8

8. 23.9, 21, none, 31, 9.99



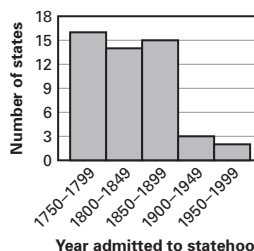
; 4196 cubic units

10. 228.24 million km 11.



12.

1750–1799	16
1800–1849	14
1850–1899	15
1900–1949	3
1950–1999	2



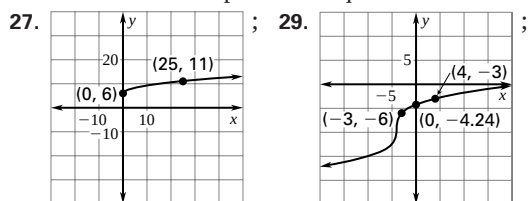
TECHNOLOGY ACTIVITY 7.7 (p. 454)

1. 17.3, 17.5, 22, 5.71 5. The second restaurant's

sandwiches have fewer calories than the sandwiches at the first restaurant. The histograms show that half of the sandwiches in the 1st restaurant contain over 500 calories while only 1 out of 10 sandwiches in the second restaurant contain over 500 calories.

CHAPTER 7 REVIEW (pp. 456–458)

1. 2 3. $\frac{1}{243}$ 5. -2
7. -1 9. $\frac{1}{25}$ 11. $\frac{\sqrt[3]{2}}{5}$ 13. $3x^{1/4}$ 15. $xyz\sqrt[6]{6yz^4}$ 17. $3x - 6$
17. $3x - 6$ 19. $2x^2 - 8x + 8$ 21. $2x - 8$ 23. $f^{-1}(x) = (-x)^{1/4}$, $x \leq 0$ 25. Both compositions equal x .



$$x \geq 0; y \geq 6$$

x and y are all real numbers.

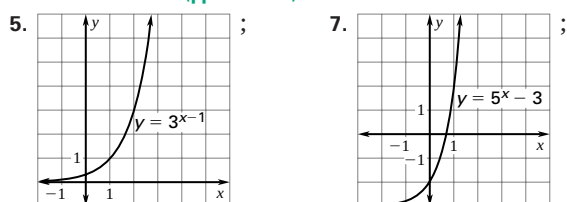
31. -3 33. 40.9, 42, 51, 42, 11.3

CHAPTER 8

SKILL REVIEW (p. 464)

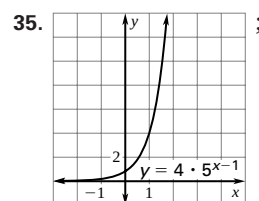
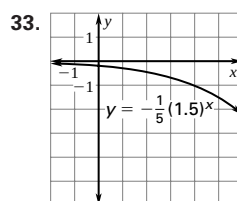
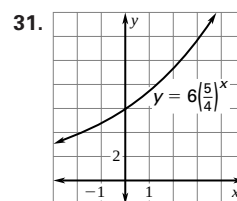
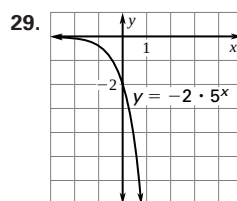
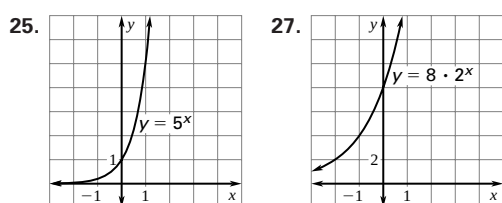
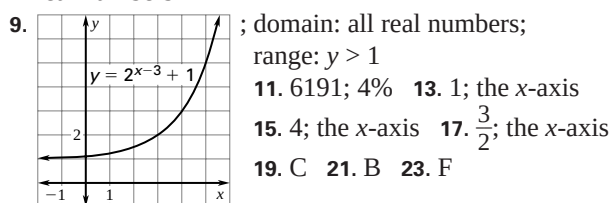
1. $\frac{1}{64}$ 2. $\frac{1}{9}$ 3. 1 4. -25 5. $\frac{2}{5}$
6. $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
7. $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
8. $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
9. $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
10. Sample answer: $y = 0.403x + 2.013$

8.1 PRACTICE (pp. 469–471)

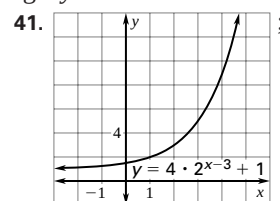
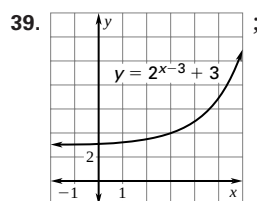


domain: all real numbers;
range: all positive
real numbers

domain: all real numbers;
range: $y > -3$



domain: all real numbers;
range: $y > 0$



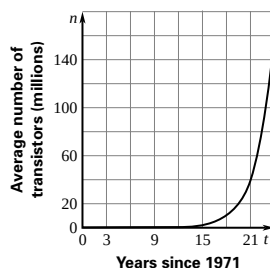
domain: all real numbers;
range: $y > 3$

domain: all real numbers;
range: $y > 1$

43. 2.91 trillion ft^3 ; 1.07; 7%

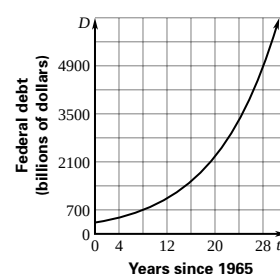
45. 8.03 trillion ft^3

- 47.



49. $E = 5(1.59)^t$;
about 32 gigawatt-hours
51. $t \approx 5.98$;
near the end of 1985

53. Federal Debt

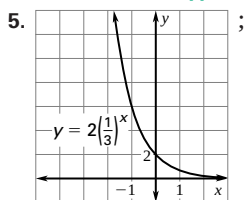


55. a. \$2600 b. \$3041.63
c. ANS + ANS $\times$ 0.01;
push "ENTER" four
times. d. \$3050.48;
this is \$8.85 more.
57. $A = 400(1.005)^{4t}$
where t is the number of
years 59. \$1724.48
61. \$1799.78 63.
\$2402.21

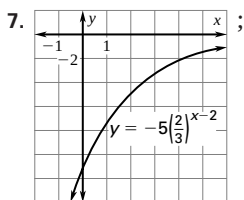
8.1 MIXED REVIEW (p. 472)

71. $\frac{1}{8}$ 73. $\frac{1}{32}$ 75. $\frac{343}{1728}$
77. $\frac{16}{25}$ 79. 2.18 81. -3 83. 3.16 85. 3 87. 3.04 89. 1.73
91. $4x^2 + 6x - 11$; all real numbers 93. $24x^3 - 44x^2$;
all real numbers 95. $24x^2 - 11$; all real numbers
97. $\frac{6x - 11}{4x^2}$; all nonzero real numbers
99. $36x - 77$; all real numbers

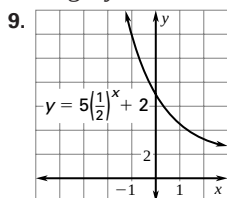
8.2 PRACTICE (pp. 477–479)



domain: all real numbers;
range: $y > 0$



domain: all real numbers;
range: $y < 0$



; domain: all real numbers;
range: $y > 2$

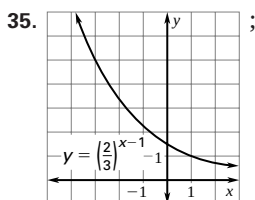
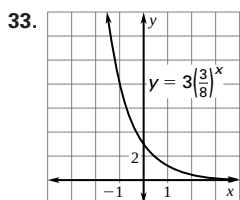
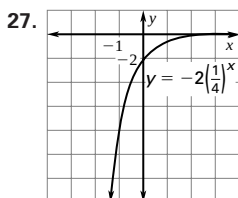
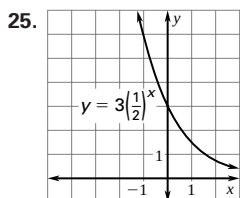
11. exponential decay

13. exponential decay

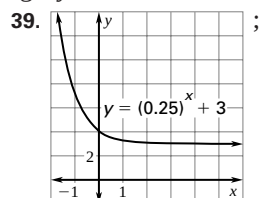
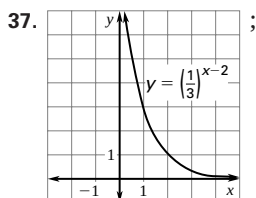
15. exponential growth

17. exponential decay

19. F 21. D 23. C

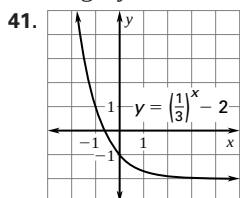


domain: all real numbers;
range: $y > 0$



domain: all real numbers;
range: $y > 0$

domain: all real numbers;
range: $y > 3$



; domain: all real numbers;
range: $y > -2$

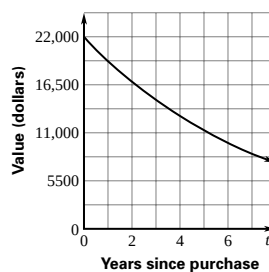
43. $V = 780(0.95)^t$

45. $i = 400(0.71)^h$

47. 265; 0.39; 61%

49. about 1988

51. Value of Car



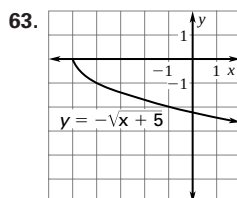
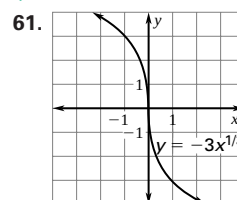
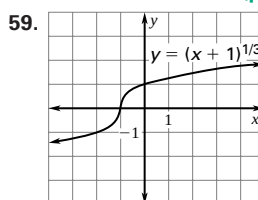
53. $V = 2100(0.5)^t$; \$525

55. after about 22 months

57. a. $V = 18,354(0.83)^t$

b. $A(n) = \left(18,354 - \frac{280}{\frac{0.085}{12}}\right) \left(1 + \frac{0.085}{12}\right)^n + \frac{280}{\frac{0.085}{12}}$

8.2 MIXED REVIEW (p. 479)

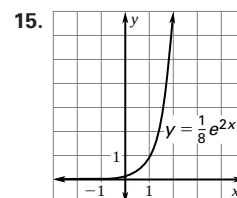
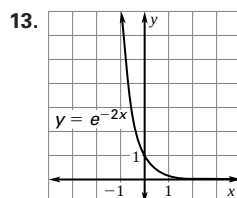


65. 16; 15; 15; 12

67. a. \$2639.86 b. \$2441.79

8.3 PRACTICE (pp. 483–485)

5. $3e^5$ 7. $\frac{64}{e^6}$ 9. $6e^{2x}$ 11. $\frac{e^6}{3}$



17. e^6 19. $\frac{e^{3x}}{3}$ 21. $3e^4$ 23. e^{-2x+5} 25. $\frac{1}{10,000e^x}$

27. $\frac{e^{x-1}}{2}$ 29. $3e^{2x}$ 31. $\frac{3}{2}e^{3x-1}$ 33. 20.086 35. 5.474

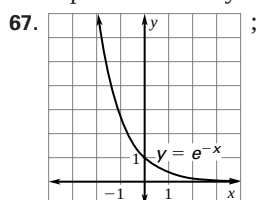
37. 0.779 39. 2980.958 41. 0.018 43. -0.199

45. -178.096 47. $4.34 \cdot 10^{-20}$ 49. exponential decay

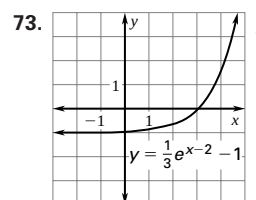
51. exponential decay 53. exponential growth

55. exponential growth 57. exponential decay

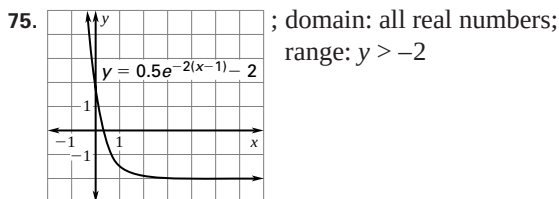
59. exponential decay 61. C 63. F 65. D



domain: all real numbers;
range: $y > 0$



domain: all real numbers;
range: $y > -1$

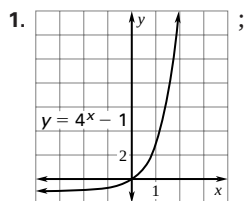


77. \$2650; \$2652.25; \$2653.41; \$2654.19; \$2654.59;
Sample answer: The extra amount of interest earned with more and more compoundings decreases drastically, with the difference between compounding monthly and continuously being only 40¢, 0.016% of the amount initially invested. 79. about 4.603 lb/in.²

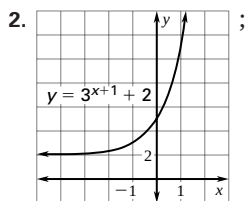
8.3 MIXED REVIEW (p. 485) 85. $f^{-1}(x) = \frac{x-7}{6}$

87. $f^{-1}(x) = 2x + 20$ 89. $f^{-1}(x) = -5x - 65$ 91. 6.2 93. 2
95. no solution

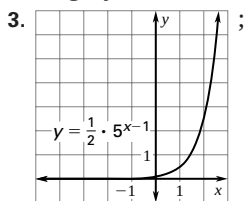
QUIZ 1 (p. 485)



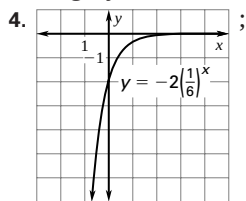
domain: all real numbers;
range: $y > -1$



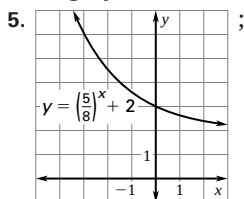
domain: all real numbers;
range: $y > 2$



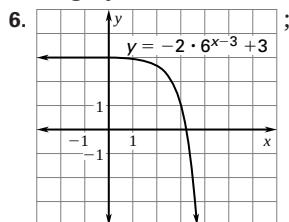
domain: all real numbers;
range: $y > 0$



domain: all real numbers;
range: $y < 0$



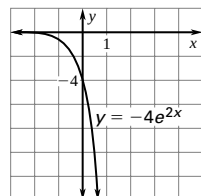
domain: all real numbers;
range: $y > 2$



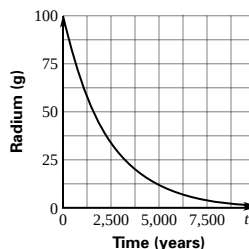
domain: all real numbers;
range: $y < 3$

7. $2e^7$ 8. $4e^2$ 9. $9e^{4x}$ 10. $\frac{e^{12x}}{5^{4x}}$ 11. $\frac{3}{4}e^{x-1}$ 12. $\frac{6}{e^{4x}}$

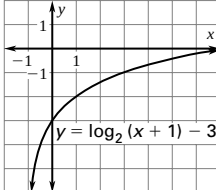
13. $4e\sqrt{x}$ 14. $5e^{2x}$ 15.



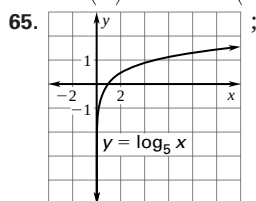
16. **Amount of Radium Left from a 100 g Sample** ; about 1.357 g



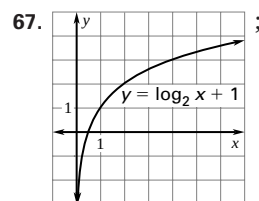
8.4 PRACTICE (pp. 490–492) 5. $3^2 = 9$ 7. $\left(\frac{1}{2}\right)^{-2} = 4$ 9. 6

11. 0 13.  ; domain: $x > -1$;
range: all real numbers
15. about 0.316 mm
17. $5^{-1} = \frac{1}{5}$
19. $8^3 = 512$

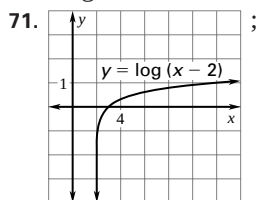
21. $14^2 = 196$ 23. $105^2 = 11,025$ 25. 3 27. 1 29. 2
31. 4 33. -0.38 35. -2 37. 2.303 39. 0.571 41. -0.523
43. 0.544 45. 5.011 47. 3.114 49. x 51. x 53. x 55. 3x
57. $y = \left(\frac{1}{4}\right)^x$ 59. $y = \left(\frac{1}{2}\right)^x$ 61. $y = \frac{e^x}{6}$ 63. $y = -2 + e^x$



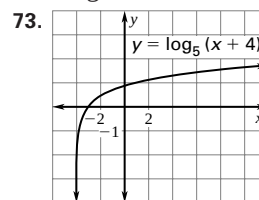
domain: $x > 0$;
range: all real numbers



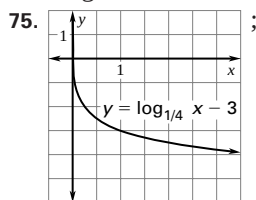
domain: $x > 0$;
range: all real numbers



domain: $x > 2$;
range: all real numbers



domain: $x > -4$;
range: all real numbers



domain: $x > 0$;
range: all real numbers

77. a. 2.4 b. 3 c. 3.5

79. about 8 (7.9982...)

81. about 205 mi

8.4 MIXED REVIEW (p. 492) 93. 3125 95. 7 97. $\frac{1}{6}$ 99. 64

101. 16 103. $\frac{1}{16}$ 105. $2x - 7 + \frac{27}{x+4}$ 107. $4x + 3 - \frac{6x+9}{x^2+2}$

109. $y = -\frac{1}{6}x(x-2)(x+3)$ 111. $y = \frac{1}{75}(x-4)(x-6)(x+4)$

- 8.5 PRACTICE** (pp. 496–498) 5. 3 7. -1 9. 1.58 11. 7.2
 13. about 26 decibels 15. -2 17. 3 19. -1 21. -6
 23. 1.398 25. 2.097 27. 2.352 29. -0.477 31. $\ln 22 + \ln x$
 33. $6 \log_6 x$ 35. $2 \log_3 5$ 37. $\ln 3 + \ln x + 3 \ln y$
 39. $2 + 2 \log_8 x$ 41. $\frac{5}{6} \log_3 12 + 9 \log_3 x$
 43. $\ln 3 + 4 \ln y - 3 \ln x$ 45. $1 + \frac{1}{2} \log_2 x$ 47. $\ln 4$
 49. $\log_{16} 1296$ 51. $\log_4 128x^5y^3$ 53. $\log_3 2\sqrt{y}$ 55. $\ln \frac{3}{x^2}$
 57. $\log_5 \frac{1}{6}$ 59. 1.277 61. 1.465 63. 1.226 65. 2.153
 67. 1.774 69. 1.585 71. -0.529 73. 1.471

75.

f	s
1.414	1.000
2.000	2.000
2.828	3.000
4.000	4.000
5.657	5.000
8.000	6.000
11.314	7.000
16.000	8.000

 ; The first row of the table shows successive powers of $\sqrt{2}$, and the second row shows the integers, beginning with 1.

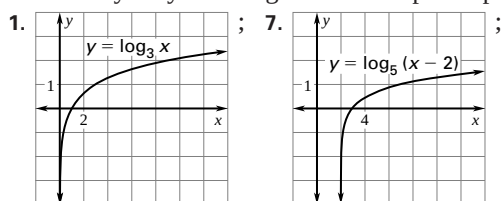
77. $E = 1.4 \log \frac{C_2}{C_1}$
 79. about 1.089 kcal/g-molecule
 81. about 95 decibels; between subway train and boiler shop
 83. about 92 decibels

85. 10 log 0.5, or about 3 decibels less

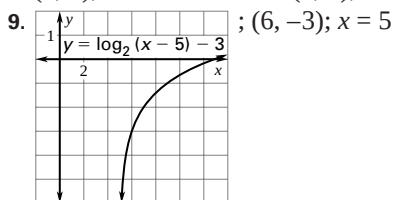
- 8.5 MIXED REVIEW** (p. 499) 93. y^{12} 95. $9x^4$
 97. $\frac{x^2}{y^2}$ 99. $\frac{xy^8}{2}$ 101. 7 103. 500 105. 6.14×10^{-6}
 107. 3.581×10^{-3} 109. 0.238 111. 1.773

TECHNOLOGY ACTIVITY 8.5 (p. 500)

Points may vary. Points given are sample responses.



(1, 0); $x = 0$ (3, 0); $x = 2$



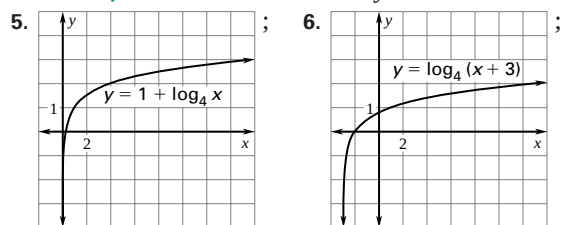
13. *Sample answer:* The domain of $y = \log x$ is all real numbers greater than 0, while that of $y = \log |x|$ is all real numbers except 0. The graph of $y = \log |x|$ is the graph of $y = \log x$ and its reflection in the y -axis.

- 8.6 PRACTICE** (pp. 505–507) 5. 1.292 7. 1 9. $\frac{\log 28 + 1}{3} \approx$
 0.816 11. 1000 13. 39.121 15. $-1 + \frac{\sqrt{39}}{3} \approx 1.082$

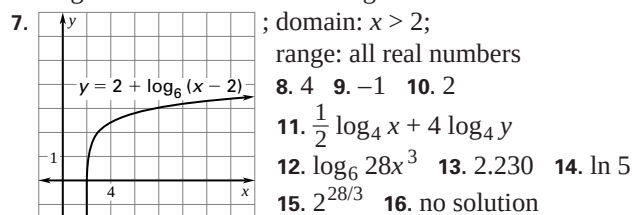
17. $e^{\log_2 5x} \neq 5x$, since e^x and $\log_2 x$ are not inverse functions. 19. yes 21. no 23. yes 25. 1 27. $-\frac{7}{5}$ 29. $\frac{16}{3}$
 31. 3.907 33. $\frac{3}{2}$ 35. $\frac{\log 5}{2} \approx 0.3495$ 37. 1
 39. $-\frac{1}{12} \log 94 \approx -0.164$ 41. 20 43. 2 45. 2187 47. 2916
 49. $-e^{7/2}$ 51. $1 + \sqrt{1 + e} \approx 2.928$ 53. no solution
 55. $\frac{1}{3}e^5$ 57. 47.158 59. no solution
 63. a little over 9 years 65. about 27.7 years
 67. Subantarctic: 8°; Antarctic intermediate: 4°; North Atlantic deep: 2°; Antarctic bottom: 0° 69. 100 mm

- 8.6 MIXED REVIEW** (p. 508) 77. Lines may vary;
 $y = 0.305x + 1.780$ 79. (4, 5) 81. (0, -6) 83. no solution
 85. $(3x^2 + 4)(x - 2)$ 87. $(x^2 + 5)(7x + 4)$

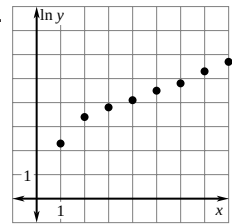
QUIZ 2 (p. 508) 1. 3 2. 4 3. 3 4. $y = e^x - 3$



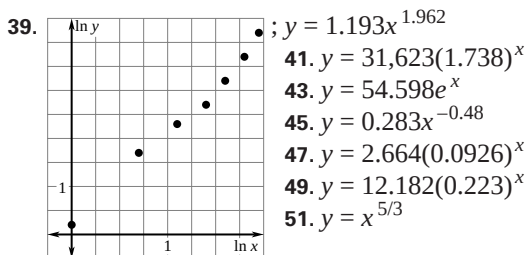
domain: $x > 0$; range: all real numbers domain: $x > -3$; range: all real numbers



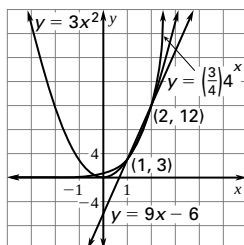
17. about 87 billion ergs

- 8.7 PRACTICE** (pp. 513–516) 5. $y = \frac{2}{9} \cdot 3^x$
 7. $y = \frac{2704}{350} \left(\frac{35}{52}\right)^x$ 9. $y = \frac{1}{\sqrt{3}} \left(\frac{\sqrt{3}}{2}\right)^x$ 11. $y = 2x^2$
 13. $y = 4x^{0.631}$ 15. $y = 0.417x^{0.263}$ 17. $y = \left(\frac{4}{3}\right)3^x$
 19. $y = \left(\frac{1}{512}\right)4^x$ 21. $y = 2^x$ 23. $y = 7\left(\frac{2}{3}\right)^x$ 25. $y = \left(\frac{1}{4}\right)5^x$
 27.  ; *Sample answer:*
 $y = 9.715(1.550)^x$

29. $y = 0.362x^{1.465}$
 31. $y = 0.358x^{2.181}$
 33. $y = 6.325x^{0.661}$
 35. $y = 7.109x^{0.482}$
 37. $y = 2.481x^{0.954}$



53. $y = 9x - 6$; $y = \frac{3}{4} \cdot 4^x$; $y = 3x^2$;



Sample answer: The linear function grows the slowest, the quadratic is in the middle, and the exponential function grows at the fastest rate.

55. a. yes b. $C = 250.31(1.104)^t$; about 35,232

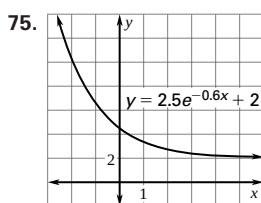
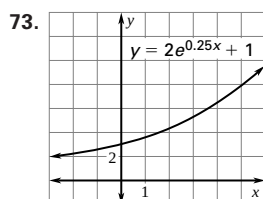
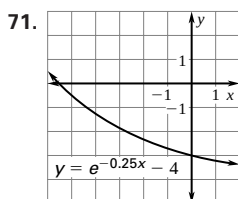
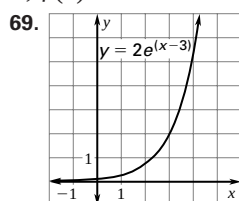
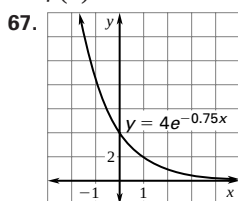
57. a. yes b. $y = 2.022x^{-0.582}$; about 354,000

8.7 MIXED REVIEW (p. 516)

61. $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$

63. $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$

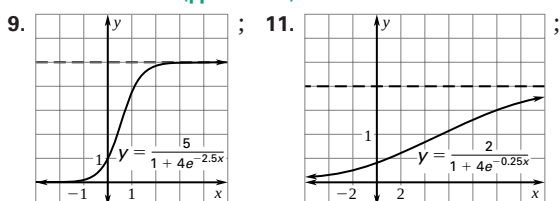
65. $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$; $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$



77. $\log 27$ 79. $\ln \frac{x^2}{4}$

81. $\log_7 3840$

8.8 PRACTICE (pp. 520–522)

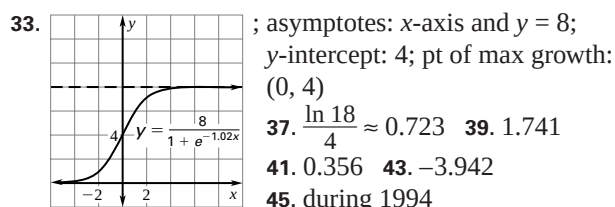
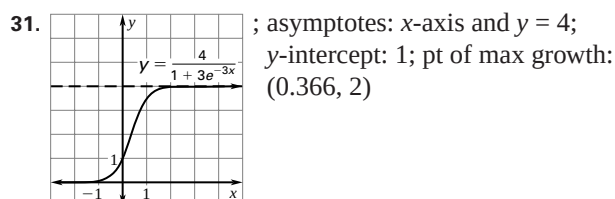
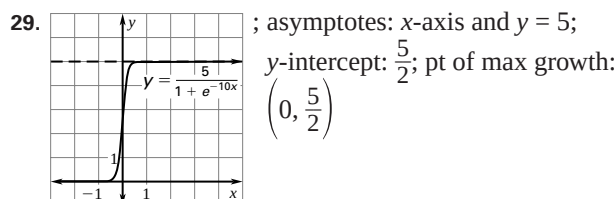
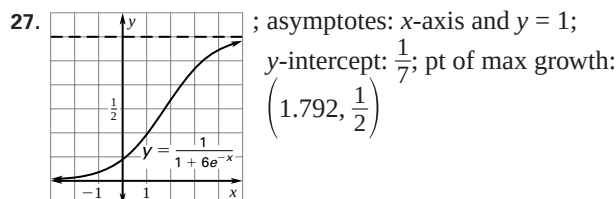


x-axis and $y = 5$; 1;
 (0.555, 2.5)

x-axis and $y = 2$; $\frac{2}{5}$;
 (5.545, 1)

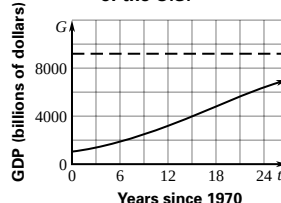
13. 0.693 15. $h = \frac{117}{1 + 18e^{-0.73t}}$ 17. 6.090 19. 0.00578

21. 2.896 23. 0.835 25. A



47. to approach 91.86 million households

49. Gross Domestic Product of the U.S. ; 51. $y = \frac{721}{1 + 72e^{-0.526t}}$

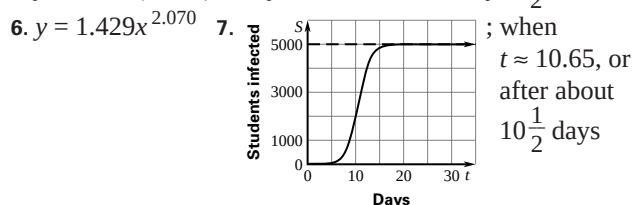


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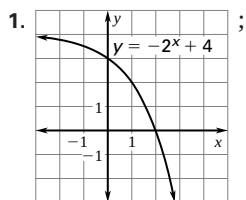
8.8 MIXED REVIEW (p. 522) 55. $y = -2x$ 57. $y = \frac{1}{8}x$
 59. $y = 0.2x$ 61. $y = 2.560(0.0872)^x$ 63. $y = 0.0174x^{-0.75}$

QUIZ 3 (p. 522) 1. $y = 1.191(1.587)^x$ 2. $y = 9.541(1.677)^x$

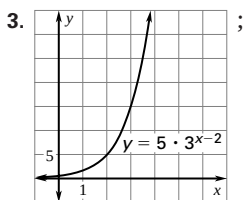
3. $y = 0.936(1.573)^x$ 4. $y = 10.693x^{1.389}$ 5. $y = \frac{1}{2}x^{2.547}$



CHAPTER 8 REVIEW (pp. 524–526)

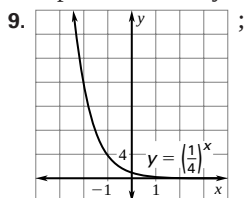


domain: all real numbers;
range: $y < 4$

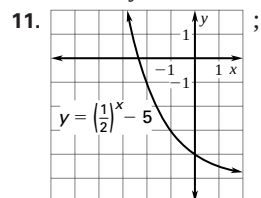


domain: all real numbers;
range: $y > 0$

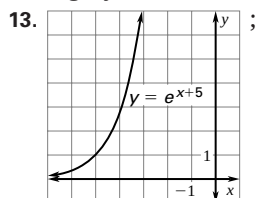
5. exponential decay 7. exponential decay



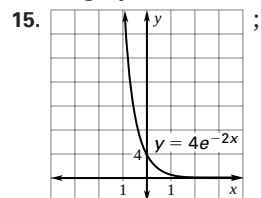
domain: all real numbers;
range: $y > 0$



domain: all real numbers;
range: $y > -5$

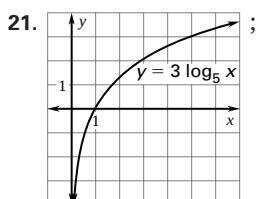


domain: all real numbers;
range: $y > 0$

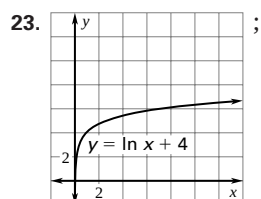


domain: all real numbers;
range: $y > 0$

17. 3 19. -2



domain: $x > 0$;
range: all real numbers



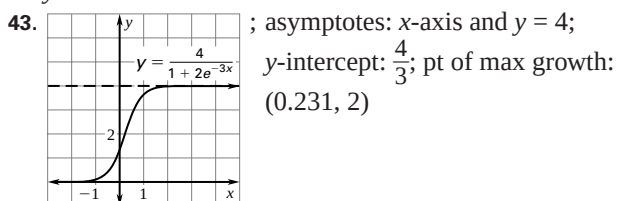
domain: $x > 0$;
range: all real numbers

25. $\log_3 6 + \log_3 x + \log_3 y$ 27. $\log 5 + 3 \log x$

29. $\ln \frac{9}{5}$ 31. $\log 18$ 33. -1.466 35. 160.49

37. $y = 3.9605(1.499)^x$ 39. $y = 2.099x^{0.696}$

41. $y = 3.188x^{1.673}$



; asymptotes: x -axis and $y = 4$;
 y -intercept: $\frac{4}{3}$; pt of max growth:
(0.231, 2)

CHAPTER 9

SKILL REVIEW (p. 532) 1. $y = \frac{5}{2}x$ 2. $y = \frac{1}{10}x$

3. $y = -\frac{1}{4}x$ 4. $y = -4x$ 5. $15x - 5$ 6. $x^3 + 7x^2 + 8x - 16$

7. $-x^3 + 5x$ 8. $x^3 + 7x^2 - 8x$ 9. $(x - 3)^2$
10. $4(x - 1)(x^2 + x + 1)$ 11. $2x(2x - 9)(2x + 9)$
12. $(2x - 1)(3x + 5)$ 13. 0, -2 14. -5, 3 15. -1, 4

9.1 PRACTICE (pp. 537–539) 5. direct variation 7. inverse variation 9. inverse variation 11. neither 13. yes 15. yes 17. yes 19. yes 21. inverse variation 23. neither

25. inverse variation 27. direct variation 29. $y = -\frac{10}{x}$; -5

31. $y = \frac{7}{x}$; 3.5 33. $y = -\frac{4}{x}$; -2 35. inverse variation

37. neither 39. $z = \frac{1}{4}xy$; -7 41. $z = 15xy$; -420

43. $z = 32xy$; -896 45. $x = \frac{kz}{y}$ 47. $w = \frac{kzy}{x}$

49. yes; $l = \frac{45\pi}{8A}$ 51. $D = \frac{k\sqrt{L}}{T^2}$ 53. 139,000,000 km

55. $W = \frac{49}{5}mh$; 1470 joules 57. 285 watts

9.1 MIXED REVIEW (p. 539)

61. ; domain: all real numbers x such that $x \geq -2$; range: all real numbers y such that $y \geq 0$

63. ; domain: all real numbers x such that $x \geq -1$; range: all real numbers y such that $y \geq -3$

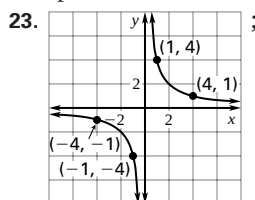
65. 128 67. 113 69. 7

9.2 PRACTICE (pp. 543–545) 5. $y = 2$; $x = -4$ 7. $y = \frac{1}{2}$; $x = 2$

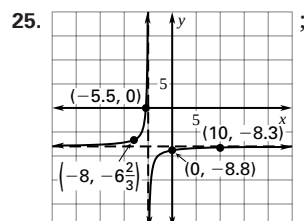
9. $y = -5$; $x = 6$ 11. $y = 2$; $x = 0$; domain: all real numbers except 0; range: all real numbers except 2 13. $y = -2$; $x = -3$; domain: all real numbers except -3; range: all real numbers except -2

15. $y = \frac{2}{3}$; $x = -\frac{1}{3}$; domain: all real numbers except $-\frac{1}{3}$; range: all real numbers except $\frac{2}{3}$

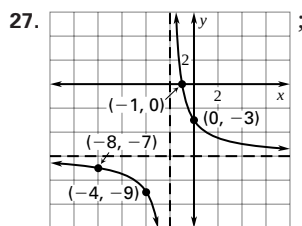
17. $y = -17$; $x = -43$; domain: all real numbers except -43; range: all real numbers except -17 19. $y = 19$; $x = 6$; domain: all real numbers except 6; range: all real numbers except 19 21. C



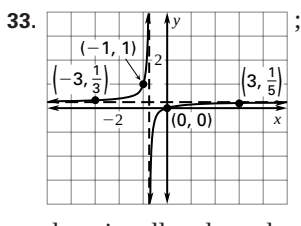
domain: all real numbers except 0; range: all real numbers except 0



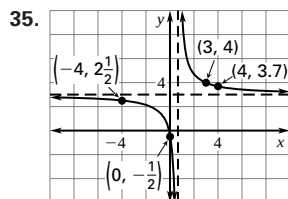
domain: all real numbers except -5; range: all real numbers except -8



domain: all real numbers except -2 ; range: all real numbers except -6

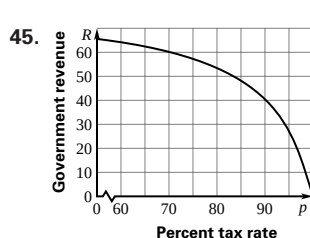


domain: all real numbers except $-\frac{3}{4}$; range: all real numbers except $\frac{1}{4}$



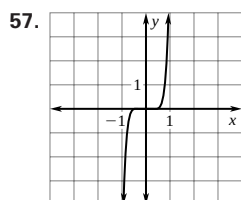
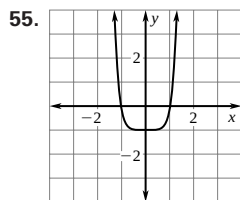
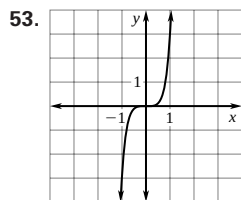
domain: all real numbers except $\frac{2}{3}$; range: all real numbers except 3

41. Sample answer:
 $y = \frac{1}{x+4} + 3$ 43. 30



47. $f = \frac{1,480,000}{740 - r}$

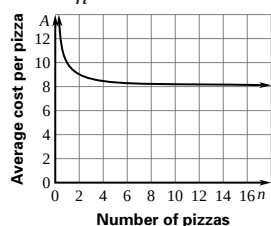
9.2 MIXED REVIEW (p. 545)



59. $(2x - 5)(4x^2 + 10x + 25)$
61. $(x + 3)(x^2 + 3)$
63. $(3x - 1)(3x + 1)(9x^2 + 1)$
65. $\frac{1}{5}e^{x-1}$ 67. e^{5x+1}
69. e^{4-x}

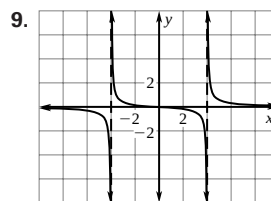
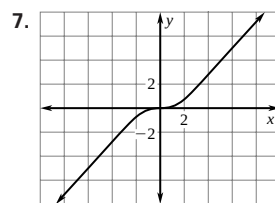
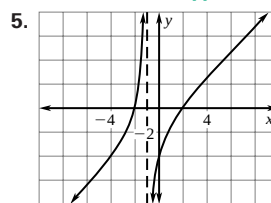
TECHNOLOGY ACTIVITY 9.2 (p. 546)

7. $A = \frac{2 + 8n}{n}$



The average cost approaches \$8.

9.3 PRACTICE (pp. 550–552)

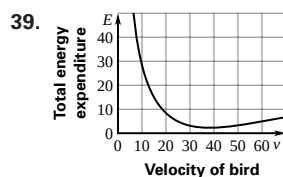
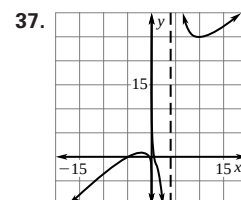
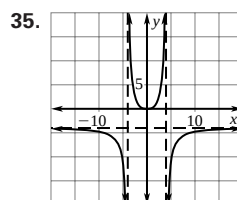
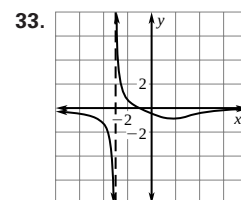
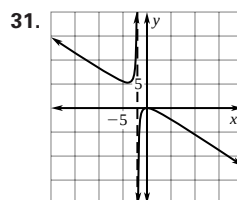
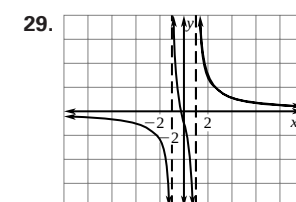
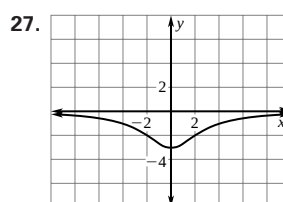


11. x-intercept: 0 ; vertical asymptotes: $x = -3, x = 3$
13. x-intercepts: $-\frac{1}{2}, 5$; vertical asymptotes: $x = -4, x = 4$
15. x-intercepts: $-5, 1$; vertical asymptote: $x = 6$

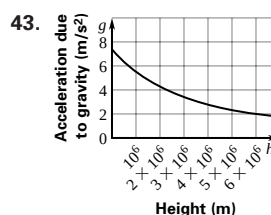
17. x-intercept: -4 ; vertical asymptotes: $x = -\sqrt{3}, x = \sqrt{3}$

19. x-intercept: 3 ; vertical asymptote: $x = 0$

21. C 23. B 25. C



about 39 km/h



41. No; this model predicts an average daily cost close to zero after 2005, and this is not realistic.

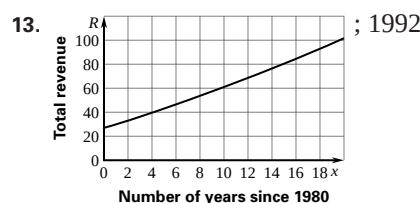
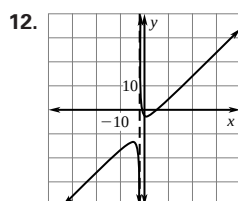
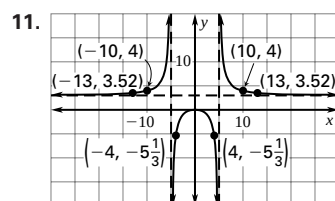
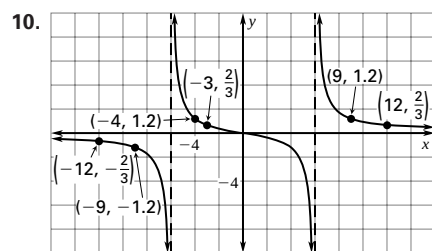
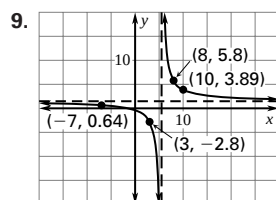
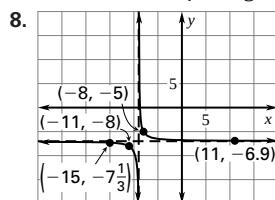
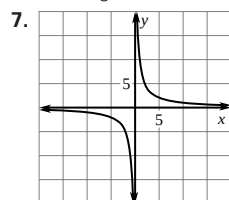
45. g' decreases as h increases.

9.3 MIXED REVIEW (p. 553) 51. x^5y^4 53. $\frac{4x^7}{y^7}$ 55. $\frac{x^6}{125y^6}$
57. $z = -\frac{3xy}{40}, \frac{9}{20}$ 59. $z = 8xy; -48$

61. $f(g(x)) = f\left(-\frac{1}{3}x + \frac{2}{3}\right) = -3\left(-\frac{1}{3}x + \frac{2}{3}\right) + 2 = x - 2 + 2 = x$; $g(f(x)) = g(-3x + 2) = -\frac{1}{3}(-3x + 2) + \frac{2}{3} = x - \frac{2}{3} + \frac{2}{3} = x$

63. $f(g(x)) = f\left(\frac{\sqrt[4]{x}}{2}\right) = 16\left(\frac{\sqrt[4]{x}}{2}\right)^4 = 16\left(\frac{x}{16}\right) = x$;
 $g(f(x)) = g(16x^4) = \frac{\sqrt[4]{16x^4}}{2} = \frac{2x}{2} = x$

QUIZ 1 (p. 553) 1. $y = -\frac{12}{x}$; 4 2. $y = \frac{66}{x}$; -22 3. $y = \frac{6}{x}$; -2
 4. $x = -\frac{yz}{6}$; -24 5. $x = 4yz$; 1 6. $x = -\frac{5yz}{4}$; $-\frac{16}{5}$



9.4 PRACTICE (p. 558–560) 3. $\frac{x}{x^2 + 3}$ 5. not possible

7. not possible 9. $\frac{x^5}{25y^2}$ 11. $\frac{x-2}{x^2}$ 13. $\frac{6y^3}{x^5}$

15. with: 6.9; without: 9.3 17. not possible

19. not possible 21. $\frac{3(x+1)}{x+2}$ 23. $\frac{x-3}{x}$ 25. not possible

27. $\frac{x^2-2}{x^2-3x+9}$ 29. $\frac{16x^3}{y^2}$ 31. $\frac{3(x+4)}{x+3}$ 33. $2(x-1)(x-3)$

35. $\frac{-(x+1)^2}{x^2}$ 37. $\frac{1}{y^2}$ 39. $\frac{1}{3x}$ 41. $\frac{(x+4)(x-2)}{x+2}$

43. $\frac{(x-3)(x+5)}{3x}$ 45. $\frac{(x-4)(x+2)}{4x^2}$ 47. $9(x+3)$

49. $3(x+2)$ 51. $H = \frac{k_2}{k_1 V^2}$ or HV^2 is a constant. A shorter

runner can run faster than a taller runner and still have the heat being generated equal the heat being released, so a shorter runner has an advantage. 53. 468.5 acres
 55. about \$4,400 million

9.4 MIXED REVIEW (p. 560) 61. 15; 1320 63. 12; 504

65. 120; 2400 67. $x^2 + 6x - 7$ 69. $x^3 + 6x^2 + 11x + 6$

71. $-6x^6 + 24x^4 + 5x^3 - 20x$

73. ; in 6.5 years

TECHNOLOGY ACTIVITY 9.4 (p. 561)

1. $\frac{x}{x+4}$ 3. $\frac{x-2}{x+1}$ 5. $\frac{2x}{3}$

9.5 PRACTICE (pp. 565–567)

5. $\frac{2x+7}{x+5}$ 7. $\frac{x^2-3x+24}{(x-4)(x+3)}$ 9. $\frac{x(x-23)}{20(2x+1)}$

11. $\frac{Pi}{1 - \left(\frac{1}{1+i}\right)^{12t}} = \frac{Pi(1+i)^{12t}}{\left(1 - \left(\frac{1}{(1+i)^{12t}}\right)\right)(1+i)^{12t}} = \frac{Pi(1+i)^{12t}}{(1+i)^{12t} - 1}$

13. $\frac{23-x}{10x^2}$ 15. $\frac{5x(x+1)}{x+8}$ 17. $\frac{1}{x}$ 19. $21x^2(x-5)$

21. $x(x+3)(x-6)$ 23. $(x-7)(x+2)(x+4)$ 25. Always; each denominator must be a factor of the LCD, so the LCD must have degree greater than or equal to each of the separate denominators. 27. $\frac{-47}{21x}$ 29. $\frac{10x+13}{(x-3)(x+3)}$

31. $\frac{11-x}{(x-2)(x+4)}$ 33. $\frac{-3(5x^2+x+2)}{(x-10)(3x+2)}$ 35. $\frac{2(x^2-5x-8)}{(x-4)(x+4)^2}$

37. $\frac{49x^2+24x-5}{6x(x-1)(x+1)}$ 39. $\frac{80}{x-27}$ 41. $\frac{-(x^3-x-1)}{3(x+1)}$ 43. $\frac{-2}{3x}$

45. $\frac{3x(x-4)}{(13x+8)(x^2-4x+16)}$

47. $M = \frac{357t^3 + 5500t^2 - 37,100t + 485,000}{(0.00418t^2 + 1)(-0.0580t + 1)}$

49. $A = \frac{391(t-1)^2 + 0.112}{0.218(t-1)^4 + 0.991(t-1)^2 + 1}$

51. about 1.2 hours after the second dose 53. $\frac{24}{7}$ ohms

9.5 MIXED REVIEW (p. 567) 57. 24 59. $\frac{16}{3}$ 61. -66

63. $-\frac{102}{23}$ 65. 72 67. $\pm 2\sqrt{5}$ 69. 2, 8 71. -7, $\frac{1}{2}$

- 9.6 PRACTICE** (pp. 571–573) 5. $-\frac{8}{3}$ 7. $\frac{3}{2}$ 9. -5 11. $-15, 0$
 13. 0 15. no 17. no 19. yes 21. 2 23. $-1, \frac{1}{4}$ 25. $-\frac{2}{3}, 2$
 27. $-\frac{3}{2}, 2$ 29. $\frac{5}{7}, 3$ 31. -3 33. $\frac{6}{17}$ 35. $-4, 4$ 37. 2, 5
 39. 4 41. $-\frac{3}{2}, 5$ 43. -5 45. no solution 47. $-2, 0$ 49. 2, 6

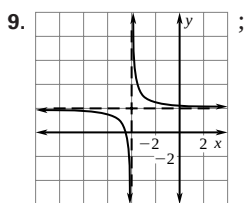
51. Always; when you solve by cross multiplying, you get $x = 1$ or $x = a$ and $x = a$ makes both fractions undefined.
 53. Always; when you multiply each side of the equation by $x^2 - a^2$, you get $x = a$, making the fractions undefined.
 55. 87 57. about 2198 flies/m³ 59. \$16.50

- 9.6 MIXED REVIEW** (p. 573) 63. 1; -1 65. $-\frac{2}{3}, \frac{3}{2}$ 67. $\frac{1}{2}, -2$
 69. $4\sqrt{3}$ 71. $6\sqrt{3}$ 73. $3\sqrt{30}$ 75. 15 77. 6.796

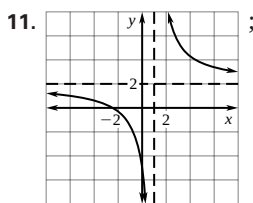
- QUIZ 2** (p. 574) 1. $\frac{5x^5y}{3}$ 2. $\frac{x-8}{5x}$ 3. $\frac{2x^2}{(x-9)(x+4)}$
 4. $\frac{16x^2-5x+6}{2(5x-6)(5x+6)}$ 5. $\frac{-6(11x+8)}{6x-1}$ 6. -6
 7. $\frac{-3(x-3)(2x-1)(2x+1)}{(x-1)(x+1)}$ 8. $\frac{2x}{(x-5)(x+1)}$ 9. 20 dozen

CHAPTER 9 REVIEW (pp. 576–578)

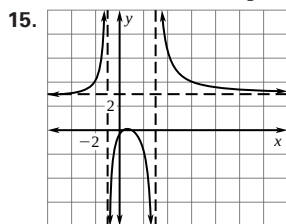
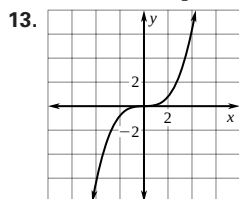
1. $y = \frac{5}{x}$; 2.5 3. $y = \frac{2}{x}$; 1 5. $z = \frac{1}{3}xy$; -10 7. $z = 3xy$; -90



domain: all real numbers;
 except -4 ; range: all real
 numbers except 2



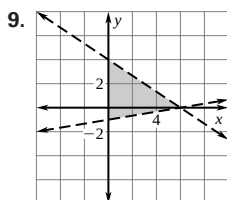
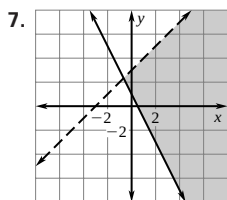
domain: all real numbers;
 except 1; range: all real
 numbers except 2



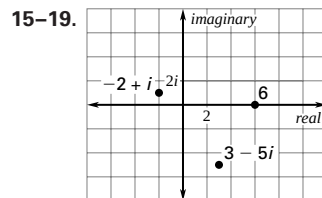
17. $5(x-6)(x+3)(x-3)$ 19. $\frac{x^3+5}{x^2(x-2)}$
 21. $\frac{-9x^2+18x-10}{5x(x-1)(x+5)}$ 23. $\frac{x(x-8)}{2(9x+2)}$ 25. $\frac{12}{5}$
 27. $\frac{3}{2}$ 29. no solution 31. $-4, 1$

CUMULATIVE PRACTICE (pp. 582–583)

1. $y = 3x - \frac{7}{2}$ 3. $y = -\frac{5}{6}x + 25$ 5. parallel

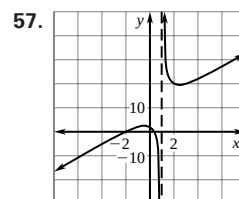
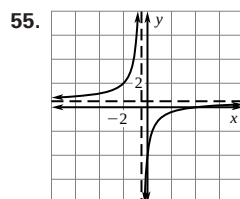
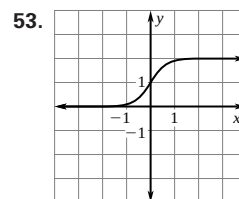
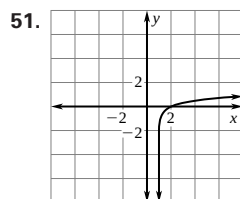
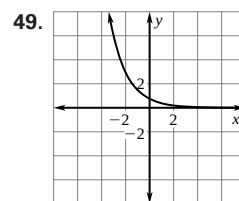
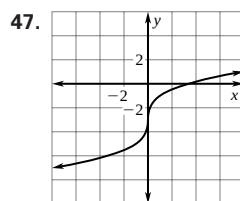


11. $\begin{bmatrix} 12 & -2 \\ -12 & 2 \end{bmatrix}$ 13. $\begin{bmatrix} -2 & -8 \\ 17 & 30 \end{bmatrix}$



15. $\sqrt{5}$ 17. 6 19. $\sqrt{34}$
 21. 5 23. $\frac{3x^4}{10}$
 25. $2ab\sqrt[4]{bc}$ 27. $\frac{1}{8e^6}$
 29. 2 31. $\frac{1}{5}$ 33. $\frac{1}{2}$

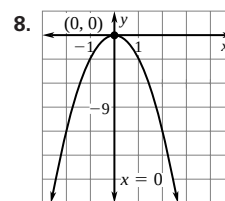
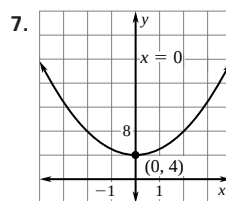
35. $-x^2 + 2x + 13$; all real numbers
 37. $-2x^2 - 15$; all real numbers 39. $f^{-1}(x) = 2(x+6)$
 41. $f^{-1}(x) = 5^x$ 43. $\log(3x^2y^3)$ 45. $\ln(x^2y^2)$

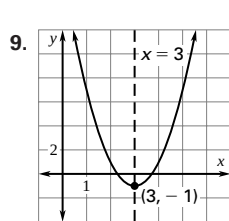


59. 10 61. $-\frac{9\sqrt{3}}{2}$ 63. $\ln 8 \approx 2.079$ 65. $-\frac{9}{5}$
 67. $y = \frac{5}{32}(2)^x$ 69. $y = 0.759(1.737)^x$ 71. $y = 1.651x^{0.861}$
 73. $y = 1.704x^{0.231}$ 75. $\frac{6x^3+7x^2-20x-9}{2x(x-1)(3x+1)}$
 77. about 3.5 sec 81. $f = \frac{kq_1q_2}{r^2}$

CHAPTER 10

- SKILL REVIEW** (p. 588) 1. $y = 2x + 4$ 2. $y = \frac{1}{3}x - \frac{8}{3}$
 3. $y = -\frac{3}{4}x - 2$ 4. (2, 3) 5. $(-1, 5)$ 6. (4, 9)

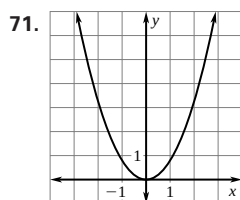
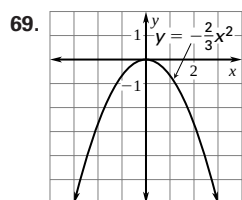
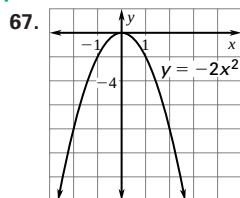
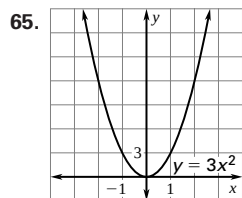




10. $-4 \pm \sqrt{2}$ 11. $-\frac{3}{2} \pm \frac{\sqrt{11}}{2}i$
12. $-3 \pm \sqrt{23}$

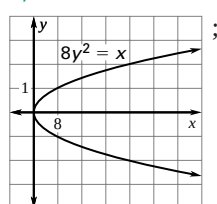
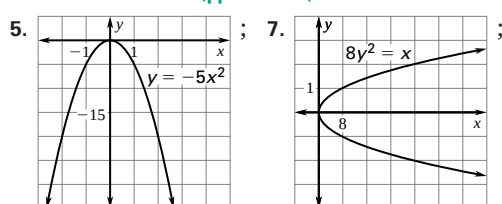
- 10.1 PRACTICE** (pp. 592–594) 5. 5 7. $3\sqrt{5} \approx 6.71$
9. $3\sqrt{34} \approx 17.49$ 11. (2, 6) 13. (2, 7) 15. $(-\frac{9}{2}, -\frac{1}{2})$
17. 5; $(\frac{3}{2}, 2)$ 19. $\sqrt{113} \approx 10.63$; $(4, \frac{1}{2})$ 21. $5\sqrt{5} \approx 11.18$;
 $(2, \frac{3}{2})$ 23. $2\sqrt{58} \approx 15.23$; $(-2, -1)$ 25. $2\sqrt{13} \approx 7.21$;
 $(5, 1)$ 27. $\sqrt{115.25} \approx 10.74$; $(1.25, -1.3)$ 29. 2.5; $(-6.25, 3)$
31. $\sqrt{\frac{377}{8}} \approx 6.86$; $(\frac{17}{8}, \frac{1}{8})$ 33. isosceles 35. scalene
37. scalene 39. scalene 41. $y = -\frac{1}{3}x + \frac{28}{3}$ 43. $y = \frac{4}{15}x + \frac{61}{30}$
45. $y = \frac{2}{15}x - 2.22$ 47. -5; 5 49. -15; -1 51. $(\frac{25}{2}, \frac{35}{2})$;
 $(\frac{75}{2}, \frac{35}{2})$ 53. about 18.97 mi 55. about 11.40 mi
57. r is about 58.56 m, v is about 20 m/sec.

10.1 MIXED REVIEW (p. 594)

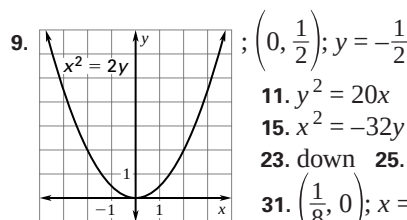


73. 525 75. 1 77. $4^{2/3} \approx 2.52$ 79. $\frac{x+6}{3x^2}$ 81. $\frac{-x^2+4x+9}{x^2+3x}$
83. $\frac{-6x^2+x-11}{(x-6)(2x+1)}$

10.2 PRACTICE (pp. 598–600)

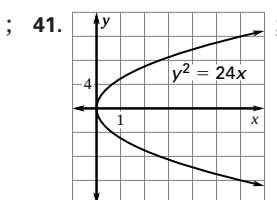
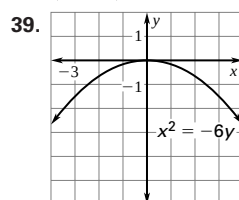


$(0, -\frac{1}{20})$; $y = \frac{1}{20}$ $(\frac{1}{32}, 0)$; $x = -\frac{1}{32}$



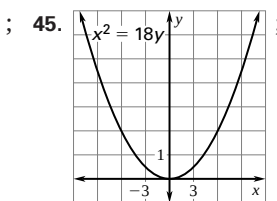
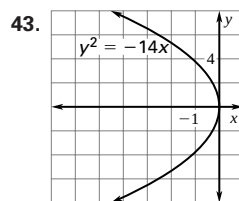
$(0, \frac{1}{2})$; $y = -\frac{1}{2}$
11. $y^2 = 20x$ 13. $y^2 = -16x$
15. $x^2 = -32y$ 17. B 19. E 21. C
23. down 25. right 27. left 29. up
31. $(\frac{1}{8}, 0)$; $x = -\frac{1}{8}$

33. $(-\frac{5}{2}, 0)$; $x = \frac{5}{2}$ 35. (0, -9); $y = 9$ 37. (0, 7); $y = -7$



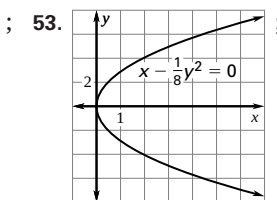
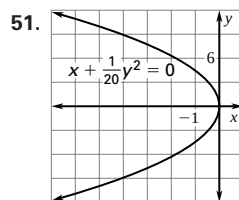
$(0, -\frac{3}{2})$; $y = \frac{3}{2}$

$(6, 0)$; $x = -6$



$(-\frac{7}{2}, 0)$; $x = \frac{7}{2}$

$(0, \frac{9}{2})$; $y = -\frac{9}{2}$



$(-5, 0)$; $x = 5$

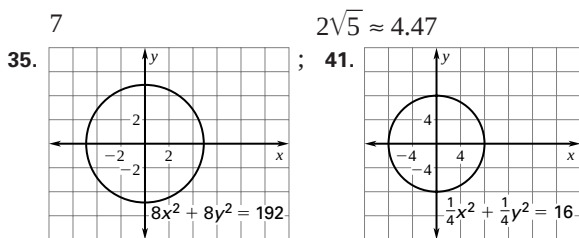
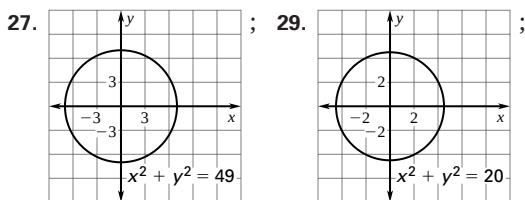
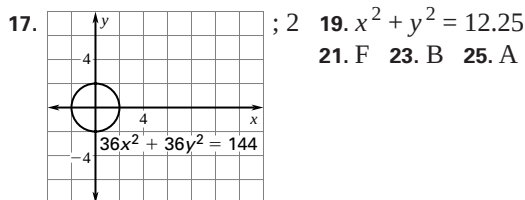
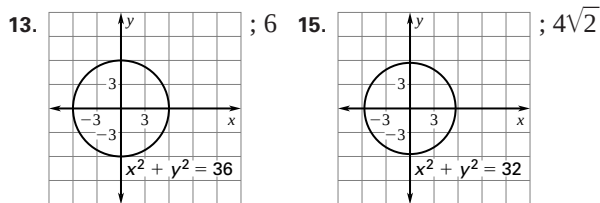
$(2, 0)$; $x = -2$

55. $y^2 = -8x$ 57. $x^2 = 4y$ 59. $x^2 = -12y$ 61. $y^2 = -20x$
63. $x^2 = -\frac{3}{2}y$ 65. $y^2 = \frac{5}{3}x$ 67. $x^2 = 12y$ 69. $y^2 = -24x$
71. $x^2 = 4y$ 73. $x^2 = -16y$ 75. $y^2 = -3x$ 77. $x^2 = \frac{1}{3}y$
79. $y^2 = 6x$; 2.04 in. 81. 2.25 in.

10.2 MIXED REVIEW (p. 600) 85. $\frac{4}{7}$ 87. about 1.209

89. no solution 91. $\frac{y^3}{2x^3}$ 93. $x + 3$ 95. $\frac{1}{6x^2}$
97. $3\sqrt{2} \approx 4.243$ 99. $\sqrt{569} \approx 23.854$ 101. $\sqrt{1733} \approx 41.629$
103. $A = 1.5p$

10.3 PRACTICE (pp. 604–606) 5. $x^2 + y^2 = 16$
7. $x^2 + y^2 = 100$ 9. $x^2 + y^2 = 117$ 11. $x^2 + y^2 = 50$

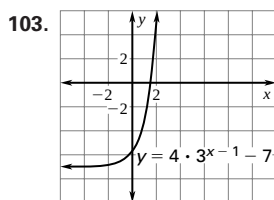
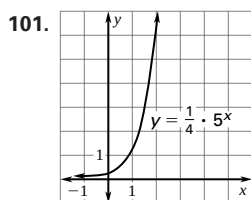


$2\sqrt{6} \approx 4.90$

47. $x^2 + y^2 = 9$ 49. $x^2 + y^2 = 36$ 51. $x^2 + y^2 = 7$
53. $x^2 + y^2 = 11$ 55. $x^2 + y^2 = 150$ 57. $x^2 + y^2 = 28$
59. $x^2 + y^2 = 100$ 61. $x^2 + y^2 = 25$ 63. $x^2 + y^2 = 34$
65. $x^2 + y^2 = 37$ 67. $x^2 + y^2 = 65$ 69. $x^2 + y^2 = 89$
71. $y = -\frac{1}{3}x + \frac{10}{3}$ 73. $y = -\frac{4}{5}x - \frac{41}{5}$ 75. $y = 8x + 65$
77. $y = -\frac{5}{6}x - \frac{61}{3}$ 79. $y = \frac{2}{3}x - \frac{13}{3}$; they have opposite
slopes and intercepts. 81. yes; about 7.92 mi 83. 16 mm
85. 36 in. 87. about 3.6 min

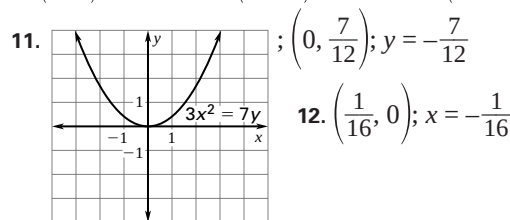
10.3 MIXED REVIEW (p. 607)

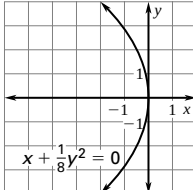
91. $(-2, -3)$ 93. $(-2, -2)$ 95. $(7, 2)$
97. $f(g(x)) = 2x + 1$; $g(f(x)) = 2x + 2$
99. $f(g(x)) = -x^2 - 10x - 26$; $g(f(x)) = -x^2 + 4$



107. $\begin{bmatrix} 35 & 52 \\ 112 & 40 \\ 95 & 63 \end{bmatrix}$

- QUIZ 1 (p. 607)** 1. 10; $(4, 3)$ 2. $6\sqrt{2} \approx 8.485$; $(0, 0)$ 3. $5\sqrt{13} \approx 18.028$; $(1, -\frac{3}{2})$ 4. $2\sqrt{17} \approx 8.246$; $(-1, -8)$ 5. $2\sqrt{37} \approx 12.166$; $(2, 5)$ 6. $4\sqrt{58} \approx 30.463$; $(5, 1)$ 7. $(\frac{3}{2}, 0)$; $x = -\frac{3}{2}$
8. $(0, \frac{3}{4})$; $y = -\frac{3}{4}$ 9. $(0, -\frac{5}{4})$; $y = \frac{5}{4}$ 10. $(-\frac{3}{8}, 0)$; $x = \frac{3}{8}$



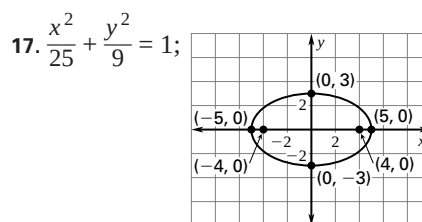
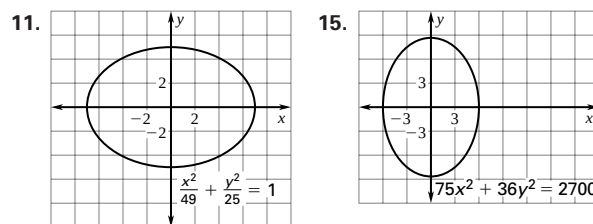
13.  ; $(-2, 0)$; $x = 2$
14. $(0, -3)$; $y = 3$ 15. $x^2 + y^2 = 9$
16. $x^2 + y^2 = 25$ 17. $x^2 + y^2 = 65$
18. $x^2 + y^2 = 29$ 19. $x^2 + y^2 = 82$
20. $x^2 + y^2 = 45$ 21. $x^2 + y^2 = 72$
22. $x^2 + y^2 = 113$

23. no; $\sqrt{35^2 + 56^2} \approx 66$ mi

TECHNOLOGY ACTIVITY 10.3 (p. 608) 1-9: Sample answers are given. 1. $-18 \leq x \leq 18$; $-12 \leq y \leq 12$ 3. $-36 \leq x \leq 36$; $-24 \leq y \leq 24$ 5. $-3 \leq x \leq 3$; $-2 \leq y \leq 2$ 7. $-9 \leq x \leq 9$; $-6 \leq y \leq 6$ 9. $-6 \leq x \leq 6$; $-4 \leq y \leq 4$

10.4 PRACTICE (pp. 612-614)

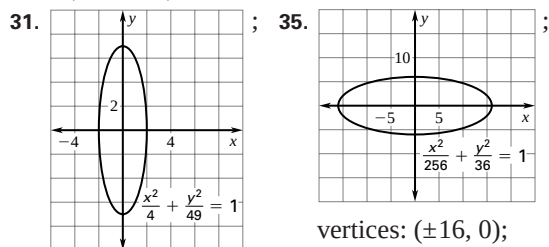
5. $\frac{x^2}{16} + \frac{y^2}{25} = 1$ 7. $\frac{x^2}{49} + \frac{y^2}{9} = 1$ 9. $\frac{x^2}{91} + \frac{y^2}{100} = 1$



19. vertices: $(\pm 11, 0)$; co-vertices: $(0, \pm 10)$; foci: $(\pm \sqrt{21}, 0)$
21. vertices: $(0, \pm 5)$; co-vertices: $(\pm 3, 0)$; foci: $(0, \pm 4)$
23. vertices: $(\pm 2\sqrt{7}, 0)$; co-vertices: $(0, \pm 2\sqrt{5})$;
foci: $(\pm 2\sqrt{2}, 0)$ 25. $\frac{x^2}{4} + \frac{y^2}{49} = 1$; vertices: $(0, \pm 7)$;
co-vertices: $(\pm 2, 0)$; foci: $(0, \pm 3\sqrt{5})$ 27. $\frac{x^2}{10} + y^2 = 1$;

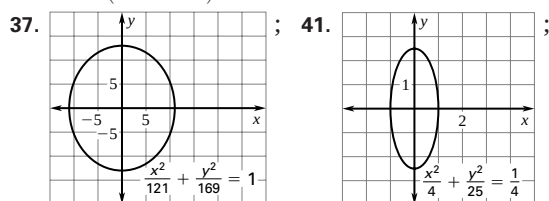
vertices: $(\pm\sqrt{10}, 0)$; co-vertices: $(0, \pm 1)$; foci: $(\pm 3, 0)$

29. $\frac{x^2}{15} + \frac{y^2}{25} = 1$; vertices: $(0, \pm 5)$; co-vertices: $(\pm\sqrt{15}, 0)$; foci: $(0, \pm\sqrt{10})$



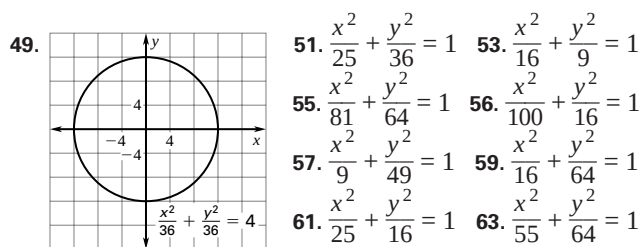
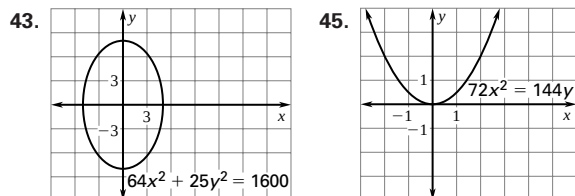
vertices: $(0, \pm 7)$;
co-vertices: $(\pm 2, 0)$;
foci: $(0, \pm 3\sqrt{5})$

vertices: $(\pm 16, 0)$;
co-vertices: $(0, \pm 6)$;
foci: $(\pm 2\sqrt{55}, 0)$



vertices: $(0, \pm 13)$;
co-vertices: $(\pm 11, 0)$;
foci: $(0, \pm 4\sqrt{3})$

vertices: $(0, \pm 2.5)$;
co-vertices: $(\pm 1, 0)$;
foci: $(0, \pm \frac{\sqrt{21}}{2})$



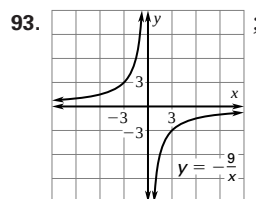
65. $\frac{x^2}{40} + \frac{y^2}{121} = 1$; 67. $\frac{x^2}{275} + \frac{y^2}{324} = 1$; 69. $\frac{x^2}{2352.25} + \frac{y^2}{529} = 1$

71. about 3500 ft² ; 73. $\frac{x^2}{92.5^2} + \frac{y^2}{77.5^2} = 1$

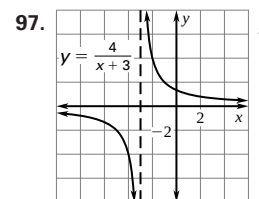
75. $3710\pi \leq A \leq 7170\pi$

10.4 MIXED REVIEW (p. 614) 79. -32 81. $\frac{1}{3}$ 83. 27

85. 16 87. $y = \frac{24}{x}$ 89. $y = \frac{72}{x}$ 91. $y = \frac{12}{x}$

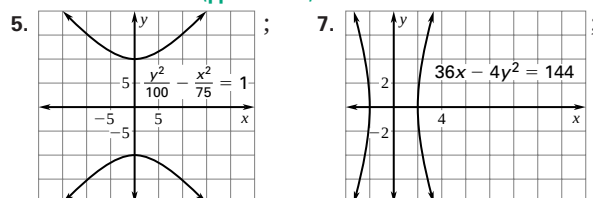


domain: all real numbers except 0; range: all real numbers except 0



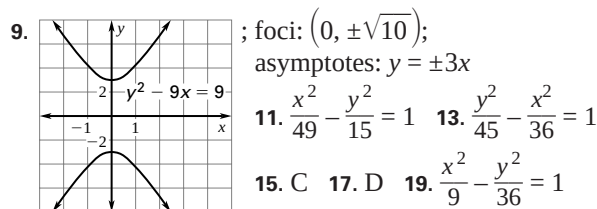
domain: all real numbers except -3; range: all real numbers except 0

10.5 PRACTICE (pp. 618–620)



foci: $(0, \pm 5\sqrt{7})$;
asymptotes: $y = \pm \frac{2\sqrt{3}}{3}x$

foci: $(\pm 2\sqrt{10}, 0)$;
asymptotes: $y = \pm 3x$

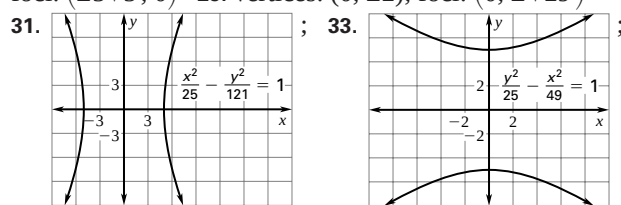


11. $\frac{x^2}{49} - \frac{y^2}{15} = 1$; 13. $\frac{y^2}{45} - \frac{x^2}{36} = 1$

15. C 17. D 19. $\frac{x^2}{9} - \frac{y^2}{36} = 1$

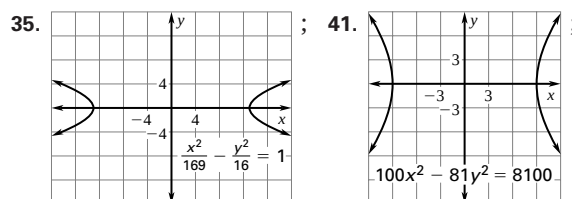
21. $\frac{y^2}{\left(\frac{1}{4}\right)} - \frac{x^2}{\left(\frac{9}{4}\right)} = 1$; 23. $\frac{y^2}{4} - \frac{x^2}{144} = 1$

25. vertices: $(\pm 3, 0)$; foci: $(\pm\sqrt{73}, 0)$; 27. vertices: $(\pm 11, 0)$;
foci: $(\pm 5\sqrt{5}, 0)$; 29. vertices: $(0, \pm 2)$; foci: $(0, \pm\sqrt{29})$



foci: $(\pm\sqrt{146}, 0)$;
asymptotes: $y = \pm \frac{11}{5}x$

foci: $(0, \pm\sqrt{74})$;
asymptotes: $y = \pm \frac{5}{7}x$



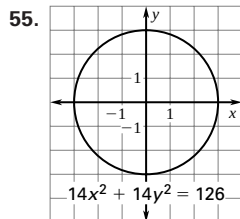
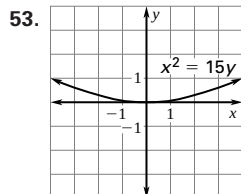
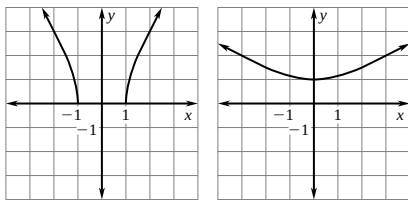
foci: $(\pm\sqrt{185}, 0)$;
asymptotes: $y = \pm \frac{4}{13}x$

foci: $(\pm\sqrt{181}, 0)$;
asymptotes: $y = \pm \frac{10}{9}x$

43. $y = \pm \frac{6\sqrt{x^2 + 100}}{5}$ 45. $y = \pm \frac{8.5\sqrt{x^2 - 42.25}}{6.5}$

47. $y = \pm \sqrt{\frac{22.3(x^2 - 10.1)}{10.1}}$

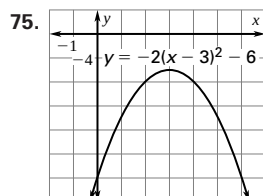
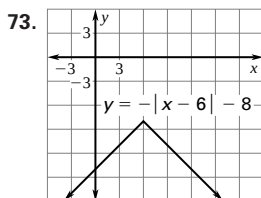
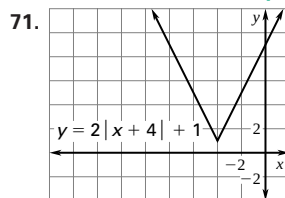
49. Sample answer:



57. $\frac{x^2}{36} - \frac{y^2}{28} = 1$ 59. $\frac{x^2}{25} - \frac{y^2}{11} = 1$ 61. $\frac{y^2}{64} - \frac{x^2}{17} = 1$

63. $\frac{y^2}{16} - \frac{x^2}{134} = 1$ 65. $\frac{y^2}{1024} - \frac{x^2}{3070} = 1$ 67. 10 mi

10.5 MIXED REVIEW (p. 621)



77. $f(x) = x^3 - 6x^2 + 11x - 6$
 79. $f(x) = x^3 - 6x^2 - 4x + 24$
 81. $f(x) = x^3 - 5x^2 + x - 5$
 83. 4 85. 4 87. 3 89. 3
 91. mean: 81.67; median: 81; modes: 81, 89; range: 36

QUIZ 2 (p. 621)

1. $\frac{x^2}{9} + \frac{y^2}{49} = 1$ 2. $\frac{x^2}{36} + y^2 = 1$ 3. $\frac{x^2}{100} + \frac{y^2}{64} = 1$

4. $\frac{x^2}{8} + \frac{y^2}{25} = 1$ 5. $\frac{x^2}{15} + \frac{y^2}{12} = 1$ 6. $\frac{x^2}{81} + \frac{y^2}{97} = 1$

7. ; 8.

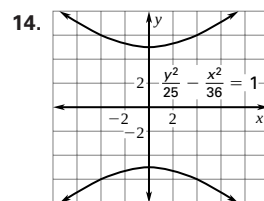
vertices: $(0, \pm 7)$;
 co-vertices: $(\pm 2, 0)$;
 foci: $(0, \pm 3\sqrt{5})$

vertices: $(\pm\sqrt{6}, 0)$;
 co-vertices: $(0, \pm 1)$;
 foci: $(\pm\sqrt{5}, 0)$

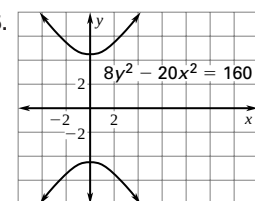
9. ; vertices: $(\pm 6, 0)$;
 co-vertices: $(0, \pm 2)$; foci: $(\pm 4\sqrt{2}, 0)$

10. $\frac{y^2}{25} - \frac{x^2}{39} = 1$ 11. $x^2 - \frac{y^2}{8} = 1$

12. $\frac{x^2}{16} - \frac{y^2}{20} = 1$ 13. $\frac{y^2}{16} - \frac{x^2}{4} = 1$



vertices: $(0, \pm 5)$;
 foci: $(0, \pm\sqrt{61})$;
 asymptotes: $y = \pm \frac{5}{6}x$



vertices: $(0, \pm 2\sqrt{5})$;
 foci: $(0, \pm 2\sqrt{7})$;
 asymptotes: $y = \pm \frac{\sqrt{10}}{2}x$

16. ; vertices: $(\pm\sqrt{2}, 0)$;
 foci: $(\pm\sqrt{11}, 0)$;
 asymptotes: $y = \pm \frac{3\sqrt{2}}{2}x$

17. $\frac{x^2}{4375^2} + \frac{y^2}{4369^2} = 1$

10.6 PRACTICE (pp. 628–630)

5. $\frac{(x - 3.5)^2}{20.25} + \frac{(y + 4)^2}{18} = 1$

7. $\frac{(y + 2)^2}{4} - \frac{(x - 5)^2}{12} = 1$ 9. hyperbola 11. ellipse

13. $(x - 9)^2 + (y - 3)^2 = 16$ 15. $(x - 1)^2 = 12(y + 2)$

17. $\frac{(x - 2)^2}{18} + \frac{(y - 1.5)^2}{20.25} = 1$ 19. $\frac{y^2}{16} - \frac{(x - 5)^2}{20} = 1$

21. center: $(6, 2)$;
 points: $(6, 4)$, $(6, 0)$, $(4, 2)$, $(8, 2)$

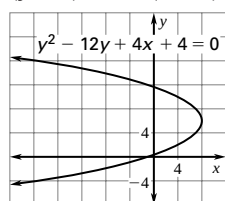
23. center: $(-3, 8)$;
 vertices: $(-3, 4)$, $(-3, 12)$;
 foci: $(-3, 8 \pm 2\sqrt{5})$

25. center: $(-1, 0)$;
 vertices: $(-5, 0)$, $(3, 0)$;
 co-vertices: $(-1, -3)$, $(-1, 3)$;
 foci: $(-1 \pm \sqrt{7}, 0)$

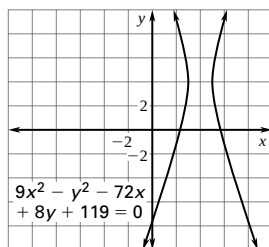
29. ellipse 31. hyperbola
 33. ellipse 35. hyperbola
 37. parabola 39. ellipse

41. circle 43. hyperbola 45. E 47. D 49. B

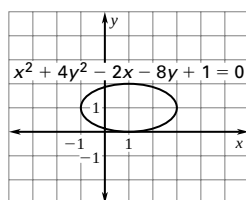
51. parabola;
 $(y - 6)^2 = -4(x - 8)$;



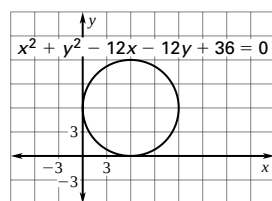
53. hyperbola;
 $(x - 4)^2 - \frac{(y - 4)^2}{9} = 1$;



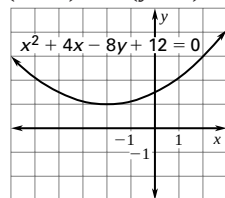
55. ellipse;
 $\frac{(x - 1)^2}{4} + (y - 1)^2 = 1$;



59. circle;
 $(x - 6)^2 + (y - 6)^2 = 36$;



61. parabola;
 $(x + 2)^2 = 8(y - 1)$;



63. $y^2 = 12x$; $y^2 = -12(x - 50)$ (x, y in ft)

65. ellipse
 67. The first is elliptical,
 the second is parabolic.

10.6 MIXED REVIEW (p. 631) 71. (5, -5) 73. (1, -2)

75. $\left(\frac{68}{23}, \frac{123}{23}\right)$ 77. 5 79. 0 81. 2 83. about 0.45
 85. about 4.03 87. about 0.27

10.7 PRACTICE (pp. 635-637) 5. (-1, 0), (-7, 0) 7. (-2, -5), (4, -5) 9. no 11. yes 13. no 15. (1, -4), (2, -1)

17. (3, 6), (-3, -6) 19. (1, -2), (-1, 2) 21. (-1, -2), $\left(\frac{7}{4}, \frac{3}{4}\right)$

23. $\left(\frac{6 - \sqrt{6}}{5}, \frac{24 + \sqrt{6}}{10}\right)$, $\left(\frac{6 + \sqrt{6}}{5}, \frac{24 - \sqrt{6}}{10}\right)$

25. $(2 + \sqrt{6}, \sqrt{6} - 2)$, $(2 - \sqrt{6}, -\sqrt{6} - 2)$

27. (0, 0), (-6, 6) 29. none 31. (0, 2), $\left(\frac{4}{3}, \frac{2}{3}\right)$

33. $\left(\pm \sqrt{\frac{5\sqrt{69} - 15}{2}}, \frac{-5 + \sqrt{69}}{2}\right)$

35. $\left(\frac{1 + \sqrt{373}}{6}, \pm \sqrt{\frac{7 + \sqrt{373}}{18}}\right)$ 37. none 39. none

41. $\left(\frac{9\sqrt{2}}{2}, -\frac{9\sqrt{2}}{2}\right)$, $\left(-\frac{9\sqrt{2}}{2}, \frac{9\sqrt{2}}{2}\right)$ 43. none 45. (4, 0)

47. (6, -8), (14, -8) 49. (2, 3) 51. $(\pm\sqrt{6}, 2)$, $(\pm\sqrt{3}, -1)$

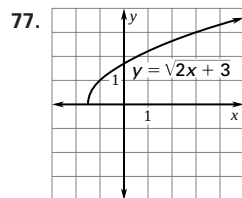
53. no intersection 55. (5, 7) 59. about 56.9 mi

61. $\left(4\sqrt{5}, \frac{6\sqrt{5}}{5}\right) \approx (8.9, 2.7)$ 63. Sample answer: The epicenter of the earthquake is about 100 kilometers east and about 1300 kilometers south of Location 1.

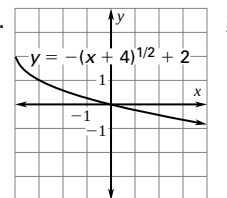
10.7 MIXED REVIEW (p. 638) 67. 13 69. 16

71. $f(x) = x^3 - x^2 - 9x + 9$ 73. $f(x) = x^2 + 4$

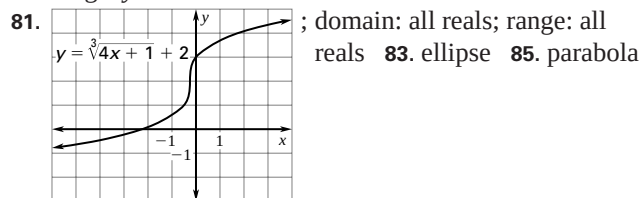
75. $f(x) = x^5 - 2x^3 - 2x^2 - 3x - 2$



domain: $x \geq -\frac{3}{2}$;
 range: $y \geq 0$



domain: $x \geq -4$;
 range: $y \leq 2$



domain: all reals; range: all reals 83. ellipse 85. parabola

QUIZ 3 (p. 638) 1. $(x + 3)^2 + (y + 5)^2 = 64$

2. $\frac{(x + 0.5)^2}{42.25} + \frac{(y - 2)^2}{22} = 1$ 3. $(y + 1)^2 = 12(x - 4)$

4. $\frac{(y - 3.5)^2}{0.25} - \frac{(x - 2)^2}{20} = 1$ 5. ellipse 6. circle 7. parabola

8. hyperbola 9. $\left(\frac{2}{3}, \frac{2}{3}\right)$, (-1, 9) 10. (2, 2), (2, 4)

11. (4, -2), (-4, -2) 12. none 13. The epicenter of the earthquake is 50 mi due west of the first seismograph.

CHAPTER 10 EXTENSION (p. 640) 1. 1 3. $\frac{\sqrt{15}}{4} \approx 0.968$

5. $\sqrt{5} \approx 2.236$ 7. $\frac{\sqrt{6}}{2} \approx 1.225$ 9. $\frac{x^2}{25} + \frac{(y + 1)^2}{16} = 1$

11. $\frac{(x - 2)^2}{60} + \frac{y^2}{64} = 1$ 13. $\frac{(y - 1)^2}{\left(\frac{64}{9}\right)} - \frac{(x - 3)^2}{\left(\frac{512}{9}\right)} = 1$

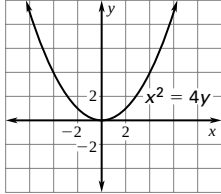
15. $\frac{(y - 2)^2}{9} - \frac{(x - 3)^2}{23.49} = 1$ 17. $\frac{x^2}{1296} + \frac{y^2}{1241} = 1$

(x, y in millions of miles) 19. In an ellipse, the foci are always within the major axis, so $c < a$ and $\frac{c}{a} < 1$. In a hyperbola, the foci are always outside the major axis, so $c > a$ and $\frac{c}{a} > 1$.

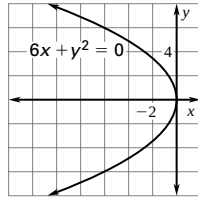
CHAPTER 10 REVIEW (pp. 642–644)

1. $\sqrt{61} \approx 7.81$; $\left(1, -\frac{1}{2}\right)$ 3. $4\sqrt{2} \approx 5.66$; $(-2, 2)$

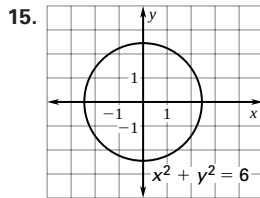
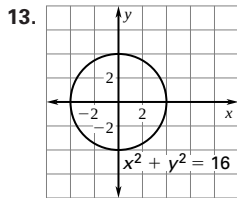
5. focus: $(0, 1)$;
directrix: $y = -1$;



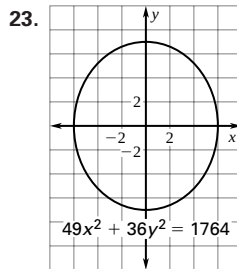
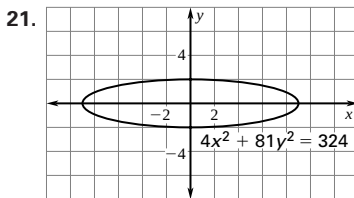
7. focus: $\left(-\frac{3}{2}, 0\right)$;
directrix: $x = \frac{3}{2}$;



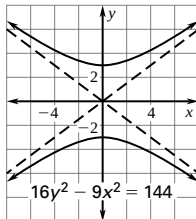
9. $y^2 = 16x$ 11. $x^2 = 8y$



17. $x^2 + y^2 = 25$ 19. $x^2 + y^2 = 13$



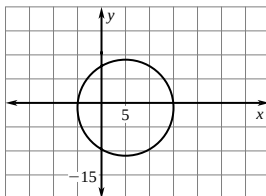
25. $\frac{x^2}{16} + \frac{y^2}{7} = 1$ 27.



29. $y^2 - \frac{x^2}{8} = 1$

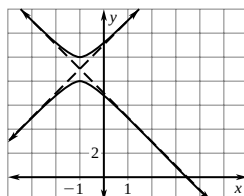
31. $\frac{x^2}{9} - \frac{y^2}{16} = 1$

33. circle; $(x - 5)^2 + (y + 1)^2 = 100$;



35. hyperbola;

$(y - 9)^2 - \frac{(x + 1)^2}{\left(\frac{1}{4}\right)} = 1$;



37. $\left(\frac{-27 - \sqrt{1649}}{10}, \frac{141 + 3\sqrt{1649}}{10}\right)$;

$\left(\frac{-27 + \sqrt{1649}}{10}, \frac{141 - 3\sqrt{1649}}{10}\right) \approx (-6.761, 26.28)$;
(1.361, 1.918) 39. $(-1, -3)$ and $(-1, 3)$

CHAPTER 11

SKILL REVIEW (p. 650) 1. $n + 4$ 2. $3n$ 3. $\frac{n}{2}$ 4. 2 5. $\frac{8}{9}$ 6. 24

7.

	$f(0)$	$f(1)$	$f(2)$	$f(3)$	$f(4)$	$f(5)$	$f(6)$
function values	3	0	-9	-24	-45	-72	-105
1st order differences	-3	-9	-15	-21	-27	-33	
2nd order differences	-6	-6	-6	-6	-6		

8.

	$f(1)$	$f(2)$	$f(3)$	$f(4)$	$f(5)$	$f(6)$
function values	3	16	45	96	175	288
1st order differences	13	29	51	79	113	
2nd order differences	16	22	28	34		
3rd order differences	6	6	6			

9.

	$f(1)$	$f(2)$	$f(3)$	$f(4)$	$f(5)$	$f(6)$
function values	-3	7	67	237	601	1267
1st order differences	10	60	170	364	666	
2nd order differences	50	110	194	302		
3rd order differences	60	84	108			
4th order differences	24	24				

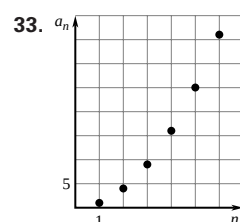
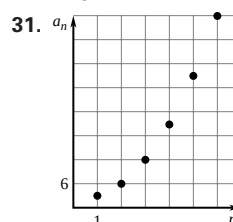
10. 7 11. 6 12. $\frac{1}{2}$ 13. $-\frac{11}{12}$

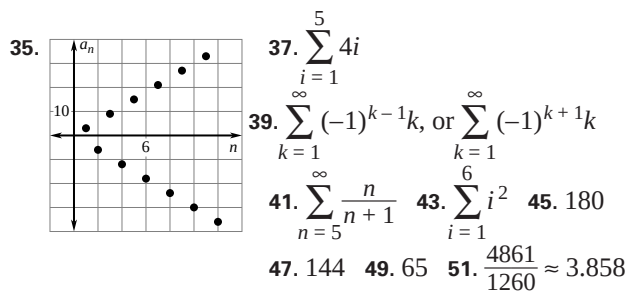
11.1 PRACTICE (pp. 655–657) 3. 2, 4, 6, 8, 10, 12 5. 4, 7, 10, 13, 16, 19 7. 68 9. 2, 3, 4, 5, 6, 7 11. 2, 1, 0, -1, -2, -3 13. 4, 9, 16, 25, 36, 49 15. 4, 7, 12, 19, 28, 39

17. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}$ 19. $\frac{3}{2}, 1, \frac{5}{6}, \frac{3}{4}, \frac{7}{10}, \frac{2}{3}$ 21. 9; $2n - 1$

23. -16; $a_n = 3n - 1$ if n is odd or $2 - 3n$ if n is even.

25. $-\frac{1}{10}$; $-\frac{1}{2n}$ 27. 2; $\frac{n}{3}$ 29. 5.9; $1.1 + 0.8n$





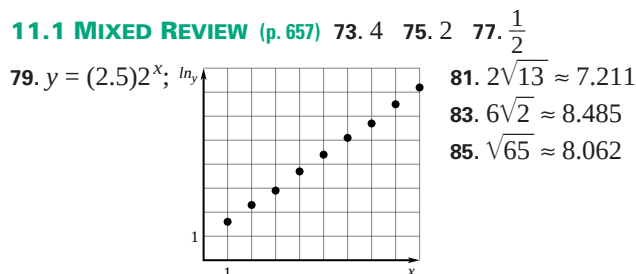
53. 3.55 55. 0 57. 15 59. 210 61. 385 63. 14,910
65. 15 ft 67. $2^n - 1$; 63 69. B

71. a. true; $\sum_{i=1}^n ka_i = ka_1 + ka_2 + \dots + ka_n =$
 $k(a_1 + a_2 + \dots + a_n) = k \sum_{i=1}^n a_i$

b. true; $\sum_{i=1}^n (a_i + b_i) = (a_1 + b_1) + (a_2 + b_2) + \dots +$
 $(a_n + b_n) = (a_1 + a_2 + \dots + a_n) + (b_1 + b_2 + \dots + b_n) =$
 $\sum_{i=1}^n a_i + \sum_{i=1}^n b_i$

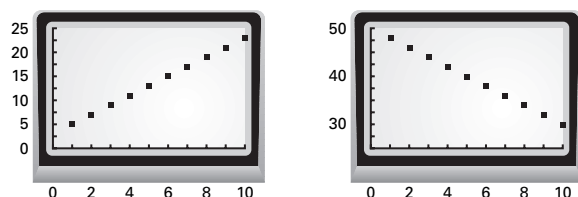
c. false; $\sum_{i=1}^4 i(i+1) = 1(2) + 2(3) + 3(4) + 4(5) =$
 $2 + 6 + 12 + 20 = 40$, but $\sum_{i=1}^4 i = 10$ and $\sum_{i=1}^4 (i+1) = 14$
and $10 \times 14 = 140 \neq 40$.

d. false; $\sum_{i=1}^5 (i)^2 = 1 + 4 + 9 + 16 + 25 = 55$,
but $\left(\sum_{i=1}^5 i\right)^2 = 15^2 = 225$.



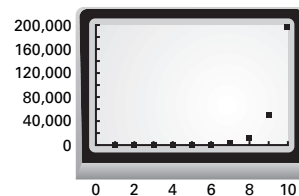
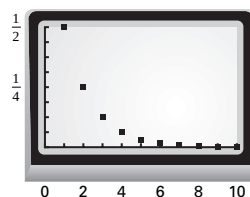
TECHNOLOGY ACTIVITY 11.1 (p. 658)

1. 5, 7, 9, 11, 13, 15, 17, 19, 3. 48, 46, 44, 42, 40, 38, 36,
21, 23; 140

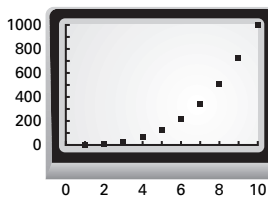


5. $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{32}, \frac{1}{64}, \frac{1}{128}, \frac{1}{256}, \frac{1}{512}, \frac{1}{1024}, \frac{1023}{1024}$

7. $\frac{3}{4}, 3, 12, 48, 192, 768,$
 $3072, 12,288, 49,152,$
 $196,608; 262,143.75$

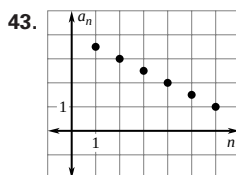
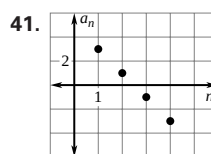
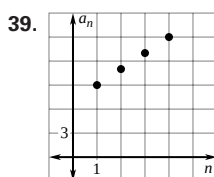


9. $\frac{4}{3}, 8\frac{1}{3}, 27\frac{1}{3}, 64\frac{1}{3}, 125\frac{1}{3},$
 $216\frac{1}{3}, 343\frac{1}{3}, 512\frac{1}{3}, 729\frac{1}{3},$
 $1000\frac{1}{3}, 3028\frac{1}{3}$



11.2 PRACTICE (pp. 663–664)

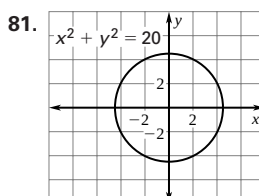
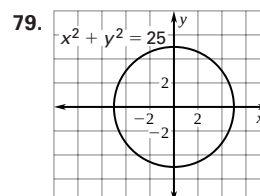
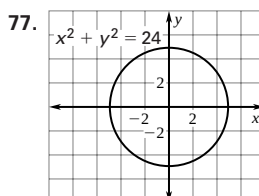
5. $a_n = 24 - 3n$
7. $a_n = -44 + 7n$ 9. $a_n = -32 + 4n$ 11. $\frac{105}{2}$ 13. 61 15. Yes;
constant difference is -3 . 17. No; difference is not constant.
19. No; difference is not constant. 21. $a_n = -1 + 2n$; 49
23. $a_n = -5 + 14n$; 345 25. $a_n = 7 - 3n$; -68
27. $a_n = \frac{41}{6} - \frac{4}{3}n$; $-\frac{53}{2}$ 29. $a_n = -0.8 + 2.4n$; 59.2
31. $a_n = 92 - 12n$ 33. $a_n = -13 + 6n$ 35. $a_n = -\frac{332}{9} + \frac{40}{9}n$
37. $a_n = -22 + 8n$



45. a. 1010 b. 12 47. a. 665 b. 15
49. a. 16,082 b. 22 51. 1110
53. -510 55. $4635\frac{1}{4}$ 57. a. $a_n = 6n$
b. 271 59. $1 + 4 \sum_{i=1}^8 2i$; 81 ft²

11.2 MIXED REVIEW (p. 665)

65. 81 67. no solution 69. 8
71. $\frac{3}{2}$ 73. 1 75. $\log_4 3.4 \approx 0.8828$



11.3 PRACTICE (pp. 670–672)

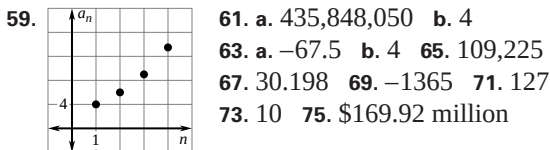
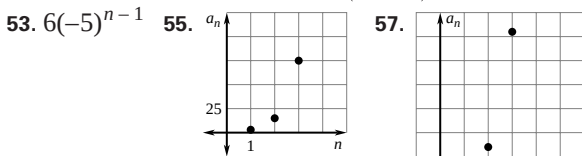
5. 6 7. 2 9. $\frac{1}{2}$
 11. 512; $2(4)^{n-1}$ 13. 0.6; $375\left(-\frac{1}{5}\right)^{n-1}$ 15. $\frac{7}{8}$; $\frac{-28}{(-2)^{n-1}}$

17. $6(-2)^{n-1}$ 19. $\left(\frac{1}{4}\right)(2\sqrt{6})^{n-1}$ 21. $-7(-4)^{n-1}$

23. \$43.11 25. neither; no common ratio or difference
 27. arithmetic; common difference of -4 29. geometric; common ratio of 3 31. neither; no common ratio or difference 33. 4 35. -2 37. $\frac{1}{2}$ 39. $(-4)^{n-1}$; -1024

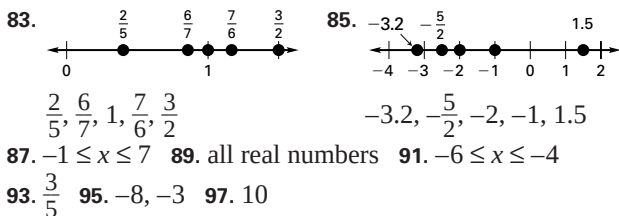
41. $2(7)^{n-1}$; 33,614 43. $5\left(-\frac{1}{3}\right)^{n-1}$; $-\frac{5}{243}$ 45. $4(3)^{n-1}$

47. $2(6)^{n-1}$ 49. $-2(8)^{n-1}$ 51. $\left(\frac{10}{\sqrt[3]{900}}\right)\left(\sqrt[3]{30}\right)^{n-1}$



77. about \$1.524 billion 79. $\left(\frac{\sqrt{3}}{4}\right)\left(\frac{3}{4}\right)^n$; 0.006

11.3 MIXED REVIEW (p. 673)



QUIZ 1 (p. 673)

1. 8; $2(n-1)$ 2. 243; 3^n
 3. $\frac{1}{80}$; $\left(\frac{1}{5}\right)\left(-\frac{1}{2}\right)^{n-1}$ 4. 354 5. 121 6. 220 7. $-3 + 4n$; 45
 8. $43 - 9n$; -65 9. $\frac{n}{2}$; 6 10. 694.5 11. $2(5)^{n-1}$;
 12,207,031,250 12. $-3(-4)^{n-1}$; -805,306,368
 13. $12\left(\frac{1}{3}\right)^{n-1}$; 2.509×10^{-6} 14. 2^{n-1} ; 1023

11.4 PRACTICE (pp. 678–679)

5. $-\frac{8}{5}$ 7. $\frac{5}{6}$ 9. $\frac{5}{9}$
 11. $\frac{245,000}{999}$ 13. no; $|r| = \frac{3}{2}$, $\frac{3}{2} > 1$ 15. yes; $|r| = \frac{1}{3}$,
 $\frac{1}{3} < 1$ 17. 2 19. $\frac{2}{3}$ 21. $\frac{16}{3}$ 23. no sum 25. $-\frac{1}{12}$
 27. $\frac{25}{336}$ 29. $\frac{3}{4}$ 31. $\frac{3}{4}$ 33. $\frac{2}{3}$ 35. $-\frac{1}{2}$ 37. $-\frac{4}{5}$ 39. $\frac{7}{9}$ 41. $\frac{17}{33}$
 43. $\frac{16}{99}$ 45. $\frac{40,000}{333}$ 47. 180 in. = 15 ft; after 16 swings

49. total distance = $\frac{20}{1 - \frac{1}{2}} = 40$ ft; total time = $\frac{1}{1 - \frac{1}{2}} = 2$ sec

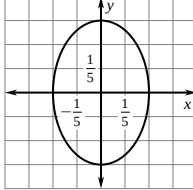
51. about M\$24.21

11.4 MIXED REVIEW (p. 680)

57. x-axis; y-axis; domain: $x \neq 0$; range: $y \neq 0$

59. $y = 1$; $x = -7$; domain: $x \neq -7$; range: $y \neq 1$

61. $y = 2.2$; $x = 0.7$; domain: $x \neq 0.7$; range: $y \neq 2.2$

63.  65. $-3 + 4n$ 67. $13 - 2n$
 69. $4\left(\frac{1}{2}\right)^{n-1}$

11.5 PRACTICE (pp. 684–685)

5. 2, 8, 32, 128, 512
 7. -1, 3, -9, 27, -81 9. 3; 10; 101; 10,202; 104,080,805
 11. $a_1 = 2$; $a_n = (3)a_{n-1}$ 13. about 3148 15. 4, 12, 21, 31,
 42 17. -4, -12, -20, -28, -36 19. 5, -4, 8, 1, 15
 21. 2, 1, 7, 8, 16 23. 48, 26, 15, 9.5, 6.75 25. 1, 3, 3, 9, 27
 27. $-7 + 10n$; $a_1 = 3$; $a_n = a_{n-1} + 10$ 29. $2 + 3n$; $a_1 = 5$;
 $a_n = a_{n-1} + 3$ 31. $5(2.5)^{n-1}$; $a_1 = 5$; $a_n = (2.5)a_{n-1}$
 33. $\left(\frac{1}{2}\right)4^{n-1}$; $a_1 = \frac{1}{2}$; $a_n = (4)a_{n-1}$ 35. $a_1 = 1$;
 $a_n = a_{n-1} + 6$ 37. $a_1 = 41$; $a_n = a_{n-1} - 9$ 39. $a_1 = 33$;
 $a_n = \frac{a_{n-1}}{3}$ 41. $a_1 = 2$; $a_2 = 5$; $a_n = a_{n-1} \cdot a_{n-2}$

43. $a_1 = 48$; $a_n = \frac{a_{n-1}}{10}$ 45. 1, 2, 4, 8, 16, 32, 64;

geometric 47. $a_1 = 32$; $a_n = 0.6a_{n-1} + 14$; about 34.77 oz

49. $a_1 = 9000$; $a_n = (0.9)a_{n-1} + 800$; 8729,

51. $a_1 = 20$; $a_n = (0.7)a_{n-1} + 20$ 53. no

11.5 MIXED REVIEW (p. 686)

59. 32 61. 4096 63. 17,576
 65. 5832 67. $\frac{36}{35x}$ 69. $\frac{-(4x+14)}{x^2-9}$ 71. $\frac{x-5}{x^2-4}$
 73. $(-1.272, 1.544)$; $(0.472, -1.944)$ 75. $(-0.980, -1.939)$;
 $(0.331, 1.993)$ 77. $(-4.742, -2.742)$; $(2.742, 4.742)$
 79. 7, 6, 5, 4, 3, 2 81. 10, 13, 18, 25, 34, 45
 83. $\frac{1}{5}, \frac{1}{3}, \frac{3}{7}, \frac{1}{2}, \frac{5}{9}, \frac{3}{5}$

QUIZ 2 (p. 687)

1. $\frac{9}{2}$ 2. $\frac{35}{13}$ 3. $-\frac{7}{8}$ 4. no sum 5. $\frac{4}{5}$ 6. $\frac{11}{12}$
 7. $\frac{7}{8}$ 8. $\frac{8}{9}$ 9. $\frac{5}{33}$ 10. $\frac{14,000}{111}$ 11. 5, 8, 11, 14, 17 12. 1, 4,
 16, 64, 256 13. 17, 19, 22, 26, 31 14. 1, 2, 1, -1, -2
 15. 2, 4, 8, 32, 256 16. 10, 10, 20, 30, 50 17. $18\frac{2}{3}$ ft

TECHNOLOGY ACTIVITY 11.5 (p. 688) 1. 5100, 4465,
 3893.5, 3379.15, 2916.24, 2499.61, 2124.65, 1787.19,
 1483.47, 1210.12, 964.11, 742.70

3. 3500, 2925, 2436.25, 2020.81, 1667.69, 1367.54,
 1112.41, 895.55, 711.21, 554.53, 421.35, 308.15

5. 103 months or 8 years, 7 months

CHAPTER 11 EXTENSION (p. 689–690)

1. $\frac{1(1+1)(2 \cdot 1+1)}{6} = \frac{6}{6} = 1 = 1^2$, so the formula is true for

$n = 1$. Suppose $1^2 + 2^2 + \dots + k^2 = \frac{k(k+1)(2k+1)}{6}$. Then

$$1^2 + 2^2 + \dots + k^2 + (k+1)^2 = \frac{k(k+1)(2k+1)}{6} + (k+1)^2 =$$

$$\frac{k(k+1)(2k+1) + 6(k+1)^2}{6} = \frac{(k+1)(2k^2 + k + 6k + 6)}{6} =$$

$$\frac{(k+1)(2k^2 + 7k + 6)}{6} = \frac{(k+1)(k+2)(2k+3)}{6} =$$

$$\frac{(k+1)[(k+1)+1][2(k+1)+1]}{6}, \text{ and the formula is true for}$$

$n = k + 1$. Therefore, the formula is true for all positive integers.

3. $\frac{a_1(1-r^1)}{1-r} = a_1 \cdot r^{1-1}$, so the statement is true for $n = 1$.

Assume it is true for $n = k$. Then $\sum_{i=1}^k a_1 r^{i-1} = \frac{a_1(1-r^k)}{1-r}$,

$$\text{so } \sum_{i=1}^{k+1} a_1 r^{i-1} = \frac{a_1(1-r^k)}{1-r} + a_1 r^{k+1-1} =$$

$$\frac{a_1(1-r^k) + a_1(r^k)(1-r)}{1-r} = \frac{a_1[(1-r^k) + r^k(1-r)]}{1-r} =$$

$$\frac{a_1(1-r^{k+1})}{1-r}, \text{ and the formula is true for } n = k + 1.$$

Therefore, the formula is true for all positive integers.

5. $\frac{5^{1+1}-5}{4} = \frac{25-5}{4} = \frac{20}{4} = 5 = 5^1$, so the formula is

true for $n = 1$. Suppose the formula is true for $n = k$.

Then $\sum_{i=1}^k 5^i = \frac{5^{k+1}-5}{4}$. So $\sum_{i=1}^{k+1} 5^i = \frac{5^{k+1}-5}{4} + 5^{k+1} =$

$$\frac{[(5^{k+1}-5) + 4(5^{k+1})]}{4} = \frac{5(5^{k+1})-5}{4} = \frac{5^{(k+1)+1}-5}{4}, \text{ and}$$

the formula is true for $n = k + 1$. Therefore, the formula is true for all positive integers.

7. A recursive formula for the n th pentagonal number is

$$P_n = P_{n-1} + 3n - 2. \frac{1(3 \cdot 1 - 1)}{2} = 1 = P_1, \text{ so the formula is}$$

true for $n = 1$. Suppose the formula is true for $n = k$. Then

$$P_k = \frac{k(3k-1)}{2}, \text{ so } P_{k+1} = \frac{k(3k-1)}{2} + 3(k+1) - 2 =$$

$$\frac{3k^2 - k + 6k + 6 - 4}{2} = \frac{3k^2 + 5k + 2}{2} = \frac{(k+1)(3k+2)}{2} =$$

$$\frac{(k+1)[3(k+1)-1]}{2}, \text{ and the formula is true for } n = k + 1.$$

Therefore, the formula is true for all positive integers.

CHAPTER 11 REVIEW (pp. 692–694)

1. 6, 9, 14, 21, 30, 41
3. 4, 2, 0, -2, -4, -6 5. 10; $2n$ 7. $\frac{1}{243}; \left(\frac{1}{3}\right)^n$ 9. $\sum_{i=1}^{\infty} i$

11. 5525 13. 78 15. $-5 + 6n$ 17. $4 - \frac{1}{2}n$ 19. $21 - 2n$

21. 1204 23. 599.4 25. $64\left(\frac{1}{2}\right)^{n-1}$ 27. $200\left(\frac{1}{10}\right)^{n-1}$

29. $-64\left(-\frac{1}{4}\right)^{n-1}$ 31. 496 33. 19.844 35. $\frac{135}{7}$ 37. 25

39. $\frac{1}{3}$ 41. $\frac{4}{5}$ 43. $\frac{7}{10}$ 45. $\frac{3}{4}$ 47. $\frac{2}{9}$ 49. $\frac{1300}{33}$ 51. 10; 40;

160; 640; 2560; 10,240 53. 2, 0, -3, -7, -12, -18

55. $a_1 = 7; a_n = 2 \cdot a_{n-1}$ 57. $a_1 = 1; a_n = a_{n-1} + 5$

59. $a_1 = 1; a_n = (a_{n-1})^2 + 1$

CHAPTER 12

SKILL REVIEW (p. 700) 1. 0.5, 50% 2. 0.2, 20% 3. 0.15,

15% 4. 0.48, 48% 5. 0.194, 19.4% 6. 0.469, 46.9%

7. 50.27 8. 25 9. 48 10. -0.301 11. 0.415 12. -0.131

12.1 PRACTICE (pp. 705–707) 5. 2 7. 1 9. 120 11. 6

13. 210 15. 3 17. 40 19. a. 17,576,000 b. 11,232,000

21. a. 6,760,000 b. 3,276,000 23. 40,320 25. 3,628,800

27. 1 29. 6 31. 6 33. 2 35. 6720 37. 1320 39. 2 41. 24

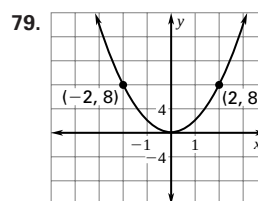
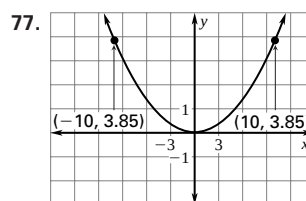
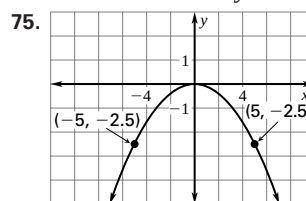
43. 720 45. 40,320 47. 3 49. 360 51. 2520 53. 10,080

55. 480 57. a. 2,176,782,336 b. 1,402,410,240

59. 6.20×10^{23} 61. a. 720 b. 60,480 63. 12,612,600

12.1 MIXED REVIEW (p. 707) 69. $x^4 + 4x^2 + 4$

71. $16x^2 - 25$ 73. $64y^2 - 16xy + x^2$



81. $-\frac{16}{3}$ 83. no sum 85. 0.714

12.2 PRACTICE (pp. 712–714) 5. 28 7. 5

9. $x^3 + 3x^2y + 3xy^2 + y^3$ 11. $8x^3 + 48x^2 + 96x + 64$

13. $x^5 - 5x^4y + 10x^3y^2 - 10x^2y^3 + 5xy^4 - y^5$

15. $81x^4 - 108x^3 + 54x^2 - 12x + 1$ 17. 270; 243

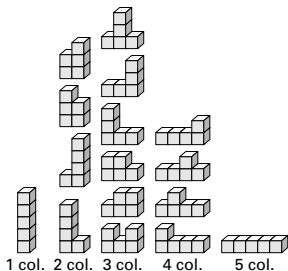
19. 56 21. 28 23. 1 25. 165 27. 48 29. 24

31. $\begin{matrix} & & 1 & & \\ & 1 & & 1 & \\ & 1 & 2 & 1 & \\ & 1 & 3 & 3 & 1 \\ & 1 & 4 & 6 & 4 & 1 \\ & 1 & 5 & 10 & 10 & 5 & 1 \\ & 1 & 6 & 15 & 20 & 15 & 6 & 1 \\ & 1 & 7 & 21 & 35 & 35 & 21 & 7 & 1 \end{matrix}$ 33. $x^6 - 18x^5y + 135x^4y^2 -$
 $540x^3y^3 + 1215x^2y^4 -$
 $1458xy^5 + 729y^6$

35. $128x^7 - 448x^6y^3 + 672x^5y^6 - 560x^4y^9 + 280x^3y^{12} -$
 $84x^2y^{15} + 14xy^{18} - y^{21}$ 37. $x^5 + 20x^4 + 160x^3 + 640x^2 +$
 $1280x + 1024$ 39. $64x^6 - 192x^5y + 240x^4y^2 - 160x^3y^3 +$
 $60x^2y^4 - 12xy^5 + y^6$ 41. $81x^8 - 324x^6 + 486x^4 -$
 $324x^2 + 81$ 43. $x^9 + 3x^6y^2 + 3x^3y^4 + y^6$ 45. 1120

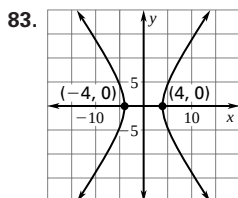
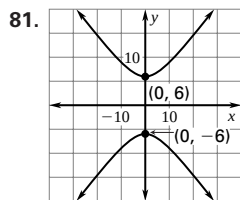
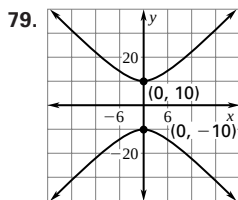
47. 120 49. 315 51. 968 53. 968

61.



63. 512 65. 2,097,151

12.2 MIXED REVIEW (p. 715) 75. 107.35 in.^2 77. 310.5 m^2



85. arithmetic; $-4 + 7n$
87. geometric; $(-2)^{n-1}$
89. arithmetic; $-15 + 5n$

QUIZ 1 (p. 715) 1. 3 2. 24 3. 120 4. 180 5. 5040

6. $40,320$ 7. $60,480$ 8. $907,200$ 9. $x^6 + 6x^5y + 15x^4y^2 + 20x^3y^3 + 15x^2y^4 + 6xy^5 + y^6$ 10. $x^4 + 8x^3 + 24x^2 + 32x + 16$ 11. $x^5 - 10x^4y + 40x^3y^2 - 80x^2y^3 + 80xy^4 - 32y^5$ 12. $27x^3 - 108x^2y + 144xy^2 - 64y^3$ 13. $x^8 + 12x^6y + 54x^4y^2 + 108x^2y^3 + 81y^4$ 14. $4096x^{12} - 12,288x^{10} + 15,360x^8 - 10,240x^6 + 3840x^4 - 768x^2 + 64$ 15. $x^9 - 3x^6y^3 + 3x^3y^6 - y^9$ 16. $32x^{20} + 400x^{16}y^2 + 2000x^{12}y^4 + 5000x^8y^6 + 6250x^4y^8 + 3125y^{10}$ 17. 90
18. 15 19. 3456 20. 1320

12.3 PRACTICE (pp. 719–722) 5. $\frac{1}{6}$ 7. $\frac{5}{6}$ 9. 0.637

11. a. 0.353 b. 0.334 13. 0.3 15. 0.4 17. 0.6
19. 0.0769 21. 0.5 23. 0.231

	theor prob	exp prob	
25.	0.333	0.308	The two probabilities are not exactly the same, but they are very similar in every case.
27.	0.5	0.508	
29.	0.833	0.875	

31. 0.455 33. 0.545 35. 0.0385 37. 0.262 39. 5.6×10^{-8}
41. a. 0.555 b. 0.0380 43. a. 0.0527 b. 0.868 45. 0.0625
47. 0.00242

12.3 MIXED REVIEW (p. 722) 51. -17 53. 19 55. -53

57. $\frac{4y^4}{3x^3}$ 59. $\frac{x+3}{x}$ 61. 3, 10, 17, 24, 31 63. 2; 8; 512;
134,217,728; 2.418×10^{24} 65. -2, 0, 2, 2, 0 67. 1,042,380

TECHNOLOGY ACTIVITY 12.3 (p. 723)

1. number	1	2	3	4	5	6
freq	19	24	20	16	20	21
theor prob	0.167	0.167	0.167	0.167	0.167	0.167
exp prob	0.158	0.200	0.167	0.133	0.167	0.175

The experimental and theoretical probabilities are close but not the same.

3. trials	10	20	50	100	200
heads	4	13	32	52	100
tails	6	7	18	48	100

As the number of trials increases, the experimental results get closer to the theoretical results.

12.4 PRACTICE (pp. 727–729) 5. 1 7. $\frac{7}{12}$ 9. $\frac{4}{5}$ 11. $\frac{3}{16}$

13. 0.25 15. $\frac{3}{7}$ 17. 0.7; no 19. $\frac{7}{17}$; no 21. $\frac{5}{6}$; no

23. 30%; no 25. 0.66 27. $\frac{1}{4}$ 29. $\frac{1}{52}$ 31. $\frac{1}{2}$ 33. 0 35. $\frac{17}{18}$,

or about 0.944 37. $\frac{7}{9}$, or about 0.778 39. $\frac{35}{36}$, or about 0.972

41. Sample answers: not 3: 0.933; ≥ 5 : 0.825; not 3 or 7: 0.783; ≤ 10 : 0.942; > 2 : 0.983; < 8 or > 11 : 0.600; The experimental results are very similar to the theoretical results. 43. 0.75 45. 0.691 47. 0.1 49. 0.375

12.4 MIXED REVIEW (p. 729) 57. 1 59. 1.892 61. 61.73

63. $x^2 + y^2 = 25$ 65. $x^2 + y^2 = 68$ 67. $x^2 + y^2 = 109$

69. $x^2 + y^2 = 256$ 71. a. 456,976,000 b. 258,336,000

12.5 PRACTICE (pp. 734–736) 5. 0.2 7. 0.08 9. 0.6

11. 0.123 13. 0.047 15. 0.078 17. 0.012 19. a. 0.0059

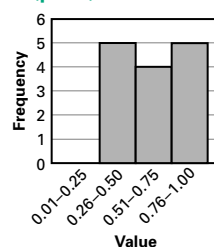
b. 0.0060 21. a. 0.0178 b. 0.0181 23. a. 0.0156

b. 0.0153 25. 0.00144 27. 0.467 29. at least 52,722 tickets

31. 0.937 33. 0.581 35. 0.751

12.5 MIXED REVIEW (p. 736)

41. 0.01–0.25	0
0.26–0.50	5
0.51–0.75	4
0.76–1.00	5



43. 3.178

45. -0.347

47. -0.326

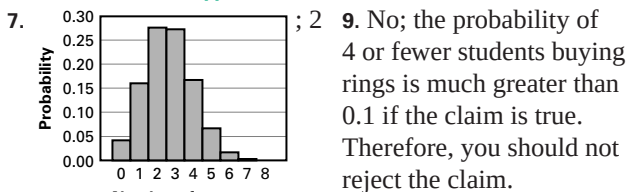
49. $128x^7 - 448x^6 + 672x^5 - 560x^4 + 280x^3 - 84x^2 + 14x - 1$ 51. $x^6 - 6x^5 + 15x^4 - 20x^3 + 15x^2 - 6x + 1$

QUIZ 2 (p. 737) 1. $\frac{12}{25}$, or 0.48 2. $\frac{6}{25}$, or 0.24

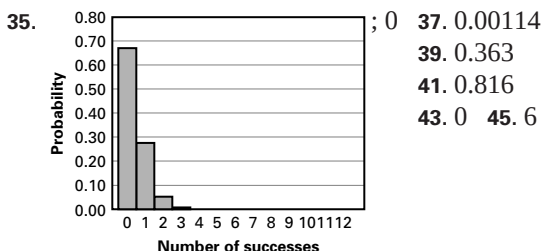
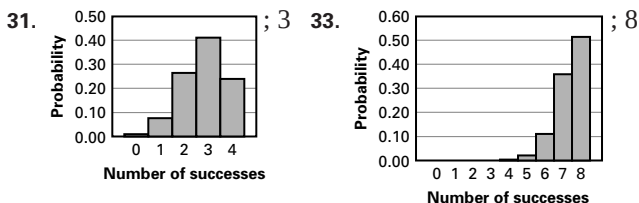
3. $\frac{18}{25}$, or 0.72 4. 0.111 5. 0.682 6. 0.207 7. 0.8 8. 0

9. 0.75 10. 0.0384

12.6 PRACTICE (pp. 742–744)



11. 0.00109 13. 0.160 15. 0.160 17. 0.00109
19. 0.00863 21. 0.0909 23. 0.00000154 25. 8.67×10^{-19}
27. 0.344 29. 0.097

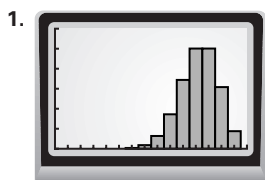


47. Reject the claim because the probability that 3 or fewer students would have attended college anyway is 0.00351, which is much smaller than 0.01.

12.6 MIXED REVIEW (p. 744)

53. 11, 4.155 55. 19, 6.708
57. $(-7, -5), (5, 7)$ 59. $(\pm \frac{1}{2}, \pm \frac{\sqrt{35}}{2})$ 61. none
63. $a_1 = 4, a_n = a_{n-1} \times 10$ 65. $a_1 = 1, a_2 = 3, a_n = a_{n-1} \times a_{n-2}$ 67. $a_1 = 1, a_2 = 2, a_n = a_{n-1} + a_{n-2}$

TECHNOLOGY ACTIVITY 12.6 (p. 745)

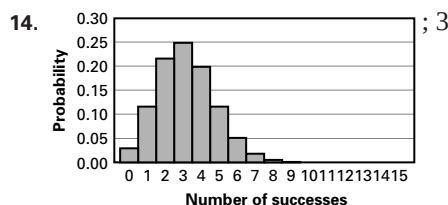
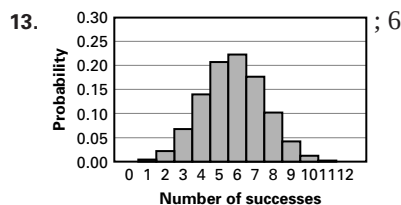
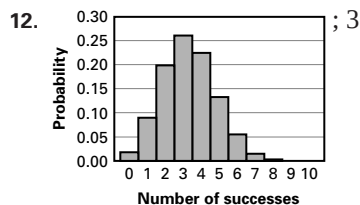
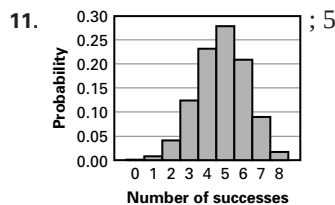
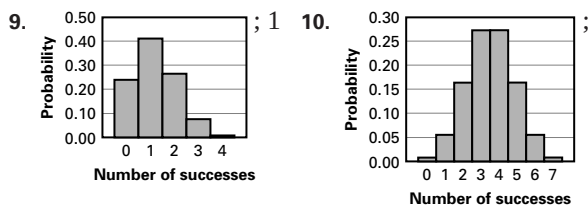


- # 12.7 PRACTICE (pp. 749–751)
5. 0.997 7. 0.5 9. 0.16
11. 5.1, 1.89 13. 5, 1.94 15. 5.1, 2.06 17. 0.16 19. 50%
21. 2.5% 23. 0.68 25. 0.9735 27. 0.84 29. 0.004096
31. 0.664 33. 5, 2.12 35. 5.88, 2.27 37. 8.4, 2.810
39. 0.95 41. 50% 43. 0.839 45. 0.145 47. 0.000625
49. 0.462 51. 0.16 53. 0.84 55. 0.999

- # 12.7 MIXED REVIEW (p. 752)
59. 64 61. 5 63. 25
65. $(0, \pm 13); (\pm 12, 0); (0, \pm 5)$ 67. $(0, \pm \sqrt{21}); (\pm \sqrt{6}, 0); (0, \pm \sqrt{15})$
69. $\frac{x^2}{7} + \frac{y^2}{10} = 1; (0, \pm \sqrt{10}); (\pm \sqrt{7}, 0); (0, \pm \sqrt{3})$
71. $\frac{11}{12}$ 73. $\frac{11}{12}$

QUIZ 3 (p. 752) 1. 0.000110 2. 0.00110 3. 0.151

4. 0.0014 5. 4.66×10^{-8} 6. 9.29×10^{-15}
7. 2.59×10^{-25} 8. 1.24×10^{-39}



15. 0.68 16. 0.4985 17. 0.9735 18. 0.50 19. 0.16
20. 0.0015 21. Yes; there is a 0.083 chance of getting 19 or fewer out of 26 and $0.083 < 0.1$, so reject the survey's findings. 22. 0.50

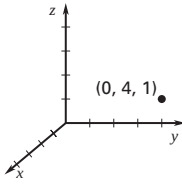
CHAPTER 12 EXTENSION (p. 754) 1. Player A expected value: $0 \cdot \frac{1}{3} + 1 \cdot \frac{1}{3} - 1 \cdot \frac{1}{3} = 0$; Player B expected value: $0 \cdot \frac{1}{3} - 1 \cdot \frac{1}{3} + 1 \cdot \frac{1}{3} = 0$; Yes, the game is fair. 3. $-\$44$

- # CHAPTER 12 REVIEW (pp. 756–758)
1. 100,000 3. 720 5. 5
7. 151,200 9. 36 11. 10 13. 1 15. $x^3 + 12x^2 + 48x + 64$
17. $x^7 - 21x^6y + 189x^5y^2 - 945x^4y^3 + 2835x^3y^4 - 5103x^2y^5 + 5103xy^6 - 2187y^7$ 19. $\frac{3}{8}$ 21. experimental probability = 0.45; theoretical probability = 0.50; you got slightly fewer heads than expected. 23. 0.3
25. 1% 27. a. 0.056 b. 0.0606 29. 0.117 31. 0.00977
33. 0.00977 35. 0.68 37. 0.025

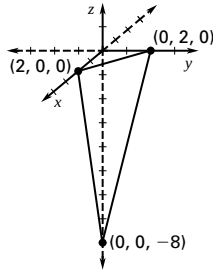
CUMULATIVE PRACTICE (pp. 762–763) 1. -7 3. 14, -8

5. $-2, -5$ 7. $4i, -4i$ 9. $\frac{1}{8} \pm \frac{\sqrt{15}}{8}i$ 11. $-1, 2, -2$ 13. 3.25

15. 25 17.

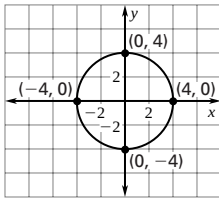


19.

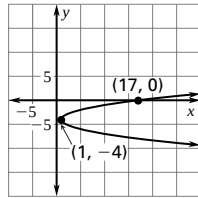


21. 18 23. 5 25. $xy = -40$; $y = -20$ 27. $xy = -16$;
 $y = -8$ 29. $z = -\frac{2}{3}xy$; $z = \frac{10}{3}$ 31. $z = 3xy$; $z = -15$
 33. $\sqrt{89} \approx 9.43$; $(2.5, 4)$ 35. $\sqrt{65} \approx 8.06$; $(1.5, -1)$

37.

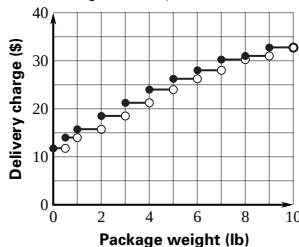


39.



41. $(x-2)^2 + (y+2)^2 = 9$ 43. $\frac{y^2}{4} - \frac{x^2}{5} = 1$ 45. $(-18, 0)$
 47. $(\pm \frac{\sqrt{6}}{2}, -\frac{1}{2})$, $(\pm \sqrt{3}, 1)$ 49. geometric; Each term is
 3 times the previous term. 51. geometric; Each term is $\frac{1}{10}$
 the previous term. 53. 9, 6, 1, $-6, -15$ 55. 1, 5, 14, 30, 55
 57. $a_n = 7 - 6n$; $a_1 = 1$; $a_n = a_{n-1} - 6$ 59. $a_n = 243(\frac{1}{3})^{n-1}$;
 $a_1 = 243$; $a_n = \frac{1}{3}a_{n-1}$ 61. 50 63. 16 65. 720 67. 70
 69. 21 71. $8x^3 + 60x^2 + 150x + 125$ 73. $81x^4 - 108x^3 +$
 $54x^2 - 12x + 1$ 75. $x^6 - 12x^4 + 48x^2 - 64$ 77. 0.2
 79. $\frac{1}{32}$ 81. $\frac{5}{16}$ 83. $\frac{5}{32}$

85.
$$C(x) = \begin{cases} 11.75, & \text{if } 0 < x \leq 0.5 \\ 14.00, & \text{if } 0.5 < x \leq 1 \\ 15.75, & \text{if } 1 < x \leq 2 \\ 18.50, & \text{if } 2 < x \leq 3 \\ 21.25, & \text{if } 3 < x \leq 4 \\ 24.00, & \text{if } 4 < x \leq 5 \\ 26.25, & \text{if } 5 < x \leq 6 \\ 28.00, & \text{if } 6 < x \leq 7 \\ 30.25, & \text{if } 7 < x \leq 8 \\ 31.00, & \text{if } 8 < x \leq 9 \\ 32.75, & \text{if } 9 < x \leq 10 \end{cases}$$



87. $a_n = 0.8a_{n-1} + 1000$;
 It approaches a limit of 5000 fish. 89. $\frac{2}{5}$

CHAPTER 13

SKILL REVIEW (p. 768) 1. 12 2. 5 3. $3\sqrt{2}$ 4. $4\sqrt{6}$

5. $3\sqrt{2}$ 6. $10\sqrt{2}$ 7. $\sqrt{2}$ 8. $\frac{2\sqrt{3}}{3}$ 9. $\frac{\sqrt{3}}{2}$ 10. -1 11. $-\frac{5}{2}, \frac{5}{2}$
 12. 14 13. -10

13.1 PRACTICE (pp. 772–774) 5. $\sin \theta = \frac{3}{5}$; $\cos \theta = \frac{4}{5}$;

$\tan \theta = \frac{3}{4}$; $\csc \theta = \frac{5}{3}$; $\sec \theta = \frac{5}{4}$; $\cot \theta = \frac{4}{3}$ 7. $\sin \theta = \frac{\sqrt{5}}{3}$;
 $\cos \theta = \frac{2}{3}$; $\tan \theta = \frac{\sqrt{5}}{2}$; $\csc \theta = \frac{3\sqrt{5}}{5}$; $\sec \theta = \frac{3}{2}$; $\cot \theta = \frac{2\sqrt{5}}{5}$

9. $B = 15^\circ$; $a \approx 19.3$; $b \approx 5.18$ 11. $B = 28^\circ$; $a \approx 56.4$; $c \approx 63.9$

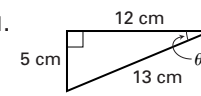
13. $A = 75^\circ$; $a \approx 157$; $c \approx 162$ 15. $\sin \theta = \frac{\sqrt{5}}{5}$; $\cos \theta = \frac{2\sqrt{5}}{5}$;

$\tan \theta = \frac{1}{2}$; $\csc \theta = \sqrt{5}$; $\sec \theta = \frac{\sqrt{5}}{2}$; $\cot \theta = 2$

17. $\sin \theta = \frac{2\sqrt{14}}{9}$; $\cos \theta = \frac{5}{9}$; $\tan \theta = \frac{2\sqrt{14}}{5}$; $\csc \theta = \frac{9\sqrt{14}}{28}$;

$\sec \theta = \frac{9}{5}$; $\cot \theta = \frac{5\sqrt{14}}{28}$ 19. $\sin \theta = \frac{9}{25}$; $\cos \theta = \frac{4\sqrt{34}}{25}$;

$\tan \theta = \frac{9\sqrt{34}}{136}$; $\csc \theta = \frac{25}{9}$; $\sec \theta = \frac{25\sqrt{34}}{136}$; $\cot \theta = \frac{4\sqrt{34}}{9}$

21. ; $\sin \theta = \frac{5}{13}$; $\cos \theta = \frac{12}{13}$; $\tan \theta = \frac{5}{12}$;
 $\csc \theta = \frac{13}{5}$; $\sec \theta = \frac{13}{12}$; $\cot \theta = \frac{12}{5}$

23. $\frac{\sqrt{22}}{2}$; $\frac{\sqrt{22}}{2}$ 25. 0.2419 27. 1.6643 29. 1.0154

31. 9.5668 33. $A = 66^\circ$; $b \approx 3.56$; $c \approx 8.76$ 35. $B = 71^\circ$;
 $a \approx 1.38$; $c \approx 4.23$ 37. $B = 61^\circ$; $a \approx 11.6$; $c \approx 24.0$

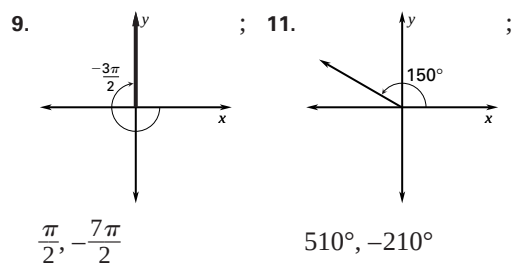
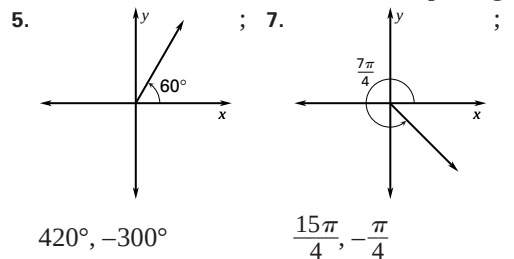
39. $A = 25^\circ$; $a \approx 5.07$; $b \approx 10.9$ 41. $96\sqrt{3}$ units²,
 or about 166 units² 43. about 400 ft 45. about 4250 ft

47. about 425 m; about 432 m 49. about 12,350 ft

13.1 MIXED REVIEW (p. 775) 55. 157.5 mi 57. \$3666

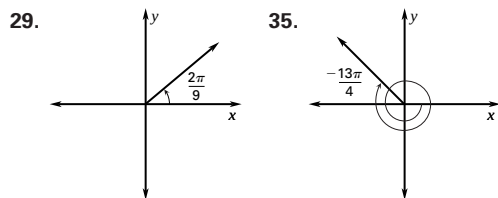
59. parabola 61. circle 63. $\frac{16,016}{50,625}$, or about 0.316

13.2 PRACTICE (pp. 780–782) 5–11. Sample angles are given.



13. $\frac{\pi}{6}$ 15. $\frac{13\pi}{9}$ 17. 315° 19. 15° 21. $\frac{11\pi}{9}$ in.; $\frac{22\pi}{9}$ in.²

23. $\frac{17\pi}{18}$ cm; $\frac{17\pi}{18}$ cm² 25. C 27. A



- 37–43. Sample angles are given. 37. 570° ; -150°
 39. 60° ; -300° 41. $\frac{\pi}{4}$; $-\frac{7\pi}{4}$ 43. $\frac{4\pi}{3}$; $-\frac{2\pi}{3}$ 45. $\frac{5\pi}{4}$ 47. $\frac{\pi}{4}$
 49. $\frac{65\pi}{36}$ 51. $-\frac{29\pi}{18}$ 53. -810° 55. -75° 57. -675°
 59. 288° 61. $\frac{\pi}{6}$ ft; $\frac{\pi}{4}$ ft² 63. 6π in.; 36π in.² 65. $\frac{175\pi}{12}$ mm;
 $\frac{875\pi}{8}$ mm² 67. $\frac{40\pi}{9}$ cm; $\frac{320\pi}{9}$ cm² 69. $\frac{1}{2}$ 71. $\sqrt{3}$
 73. 1.3764 75. 0.6428 77. 540° ; 3π 79. 1260° ; 7π
 81. about 1820° or $\frac{91\pi}{9}$ radians 83. about 528 in.²
 85. 2π 87. $\frac{5}{3}$ in.

13.2 MIXED REVIEW (p. 783)

93. $5\sqrt{11}$ 95. 16 97. $\frac{\sqrt{7}}{4}$
 99. $\frac{2\sqrt{14}}{7}$ 101. $\frac{4}{3}$ 103. $\frac{144}{35}$ 105. $\frac{100}{37}$ 107. $y^2 = 20x$
 109. $y^2 = 24x$ 111. $x^2 = -17.6y$

QUIZ 1 (p. 783) 1. $\sin \theta = \frac{8}{17}$; $\cos \theta = \frac{15}{17}$; $\tan \theta = \frac{8}{15}$;
 $\csc \theta = \frac{17}{8}$; $\sec \theta = \frac{17}{15}$; $\cot \theta = \frac{15}{8}$ 2. $\sin \theta = \frac{3\sqrt{58}}{58}$;
 $\cos \theta = \frac{7\sqrt{58}}{58}$; $\tan \theta = \frac{3}{7}$; $\csc \theta = \frac{\sqrt{58}}{3}$; $\sec \theta = \frac{\sqrt{58}}{7}$;
 $\cot \theta = \frac{7}{3}$ 3. $\sin \theta = \frac{6\sqrt{61}}{61}$; $\cos \theta = \frac{5\sqrt{61}}{61}$; $\tan \theta = \frac{6}{5}$;
 $\csc \theta = \frac{\sqrt{61}}{6}$; $\sec \theta = \frac{\sqrt{61}}{5}$; $\cot \theta = \frac{5}{6}$ 4. $A = 40^\circ$; $b \approx 21.5$

$c \approx 28.0$ 5. $B = 57^\circ$; $a \approx 6.54$; $b \approx 10.1$ 6. $B = 80^\circ$;
 $b \approx 17.0$; $c \approx 17.3$ 7. $A = 19^\circ$; $a \approx 0.749$; $b \approx 2.17$

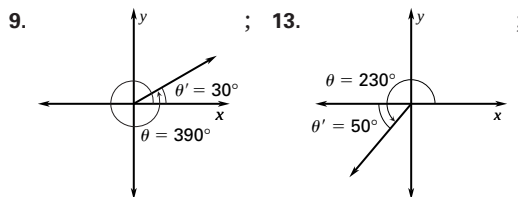
8–11. Sample answers are given. 8. 385° ; -335°

9. $\frac{4\pi}{3}$; $-\frac{8\pi}{3}$ 10. $\frac{\pi}{4}$; $-\frac{7\pi}{4}$ 11. 280° ; -80° 12. 2π m; 6π m²
 13. $\frac{5\pi}{3}$ ft; $\frac{5\pi}{3}$ ft² 14. $\frac{8\pi}{9}$ cm; $\frac{32\pi}{9}$ cm² 15. $\frac{242\pi}{9}$ in.;
 $\frac{2662\pi}{9}$ in.² 16. $\frac{25\pi}{12}$ ft; $\frac{125\pi}{24}$ ft² 17. $\frac{32\pi}{3}$ mm; 64π mm²

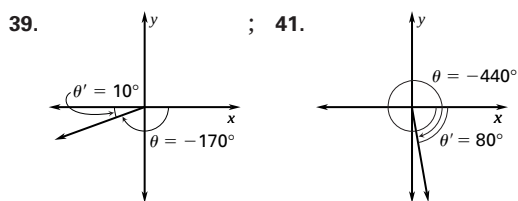
18. The 6 in. slice has an area of 18.85 in.² and costs about \$.80/in.², while the 7 in. slice has an area of about 19.24 in.² and costs about \$.09/in.². The 6 in. slice has a lower unit price, so it is a better deal.

13.3 PRACTICE (pp. 788–790)

5. $\sin \theta = -\frac{5\sqrt{41}}{41}$; $\cos \theta = -\frac{4\sqrt{41}}{41}$; $\tan \theta = \frac{5}{4}$;
 $\csc \theta = -\frac{\sqrt{41}}{5}$; $\sec \theta = -\frac{\sqrt{41}}{4}$; $\cot \theta = \frac{4}{5}$



30° 50°
 15. $\sqrt{3}$ 17. $\sqrt{2}$ 19. $-\frac{1}{2}$ 21. $-\frac{\sqrt{3}}{3}$ 23. $\sin \theta = \frac{5}{13}$;
 $\cos \theta = -\frac{12}{13}$; $\tan \theta = -\frac{5}{12}$; $\csc \theta = \frac{13}{5}$; $\sec \theta = -\frac{13}{12}$;
 $\cot \theta = -\frac{12}{5}$ 25. $\sin \theta = \frac{14\sqrt{277}}{277}$; $\cos \theta = -\frac{9\sqrt{277}}{277}$;
 $\tan \theta = -\frac{14}{9}$; $\csc \theta = \frac{\sqrt{277}}{14}$; $\sec \theta = -\frac{\sqrt{277}}{9}$; $\cot \theta = -\frac{9}{14}$
 27. $\sin \theta = \frac{\sqrt{2}}{2}$; $\cos \theta = -\frac{\sqrt{2}}{2}$; $\tan \theta = -1$; $\csc \theta = \sqrt{2}$;
 $\sec \theta = -\sqrt{2}$; $\cot \theta = -1$ 29. $\sin \theta = -\frac{3\sqrt{13}}{13}$;
 $\cos \theta = \frac{2\sqrt{13}}{13}$; $\tan \theta = -\frac{3}{2}$; $\csc \theta = -\frac{\sqrt{13}}{3}$; $\sec \theta = \frac{\sqrt{13}}{2}$;
 $\cot \theta = -\frac{2}{3}$ 31. $\sin \theta = -\frac{\sqrt{3}}{2}$; $\cos \theta = \frac{1}{2}$; $\tan \theta = -\sqrt{3}$;
 $\csc \theta = -\frac{2\sqrt{3}}{3}$; $\sec \theta = 2$; $\cot \theta = -\frac{\sqrt{3}}{3}$ 33. $\sin \theta = \frac{\sqrt{7}}{4}$;
 $\cos \theta = -\frac{3}{4}$; $\tan \theta = -\frac{\sqrt{7}}{3}$; $\csc \theta = \frac{4\sqrt{7}}{7}$; $\sec \theta = -\frac{4}{3}$;
 $\cot \theta = -\frac{3\sqrt{7}}{7}$ 35. $\sin 270^\circ = -1$; $\cos 270^\circ = 0$; $\tan 270^\circ$
 is undefined; $\csc 270^\circ = -1$; $\sec 270^\circ$ is undefined;
 $\cot 270^\circ = 0$.

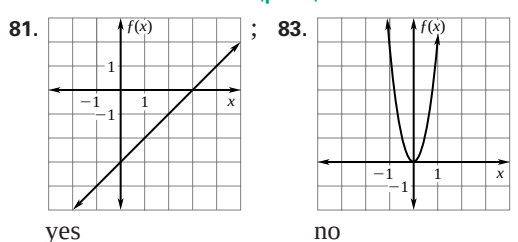


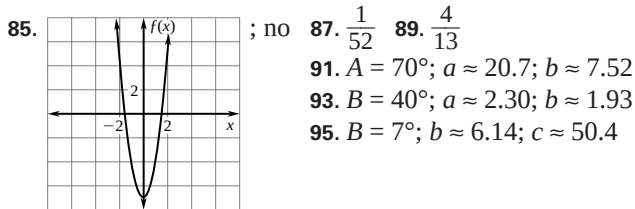
10° 80°
 43.

45. $\frac{\sqrt{2}}{2}$ 47. $\frac{2\sqrt{3}}{3}$ 49. 2
 51. $-\frac{\sqrt{2}}{2}$ 53. $-\sqrt{3}$ 55. $-\frac{1}{2}$
 57. $-\frac{1}{2}$ 59. $-\frac{2\sqrt{3}}{3}$ 61. -1.3673
 63. -0.1736 65. 1.3764

67. -0.8090 69. about 16.5 ft/sec 71. about 7.4 ft
 73. about 22,800 mi 75. about $(-24, 93)$

13.3 MIXED REVIEW (p. 790)





- 13.4 PRACTICE** (pp. 795–797) 5. $\frac{\pi}{3}$, or 60° 7. $\frac{\pi}{6}$, or 30°
 9. 1.32; 75.6° 11. 1.22; 70.1° 13. 200° 15. 295°
 17. about 42.3° 19. $\frac{\pi}{3}$; 60° 21. 0; 0° 23. $-\frac{\pi}{2}$; -90°
 25. $\frac{5\pi}{6}$; 150° 27. 48.2° 29. 120° 31. 18.4° 33. 1.33; 76.1°
 35. 0.848; 48.6° 37. 2.21; 127° 39. 1.15; 66.0°
 41. 1.43; 81.9° 43. 0.988; 56.6° 45. 247° 47. 127°
 49. 224° 51. 222° 53. about 44.4° 55. about 70.2°
 57. $\theta = \tan^{-1}(2.127t)$ 59. about 71.6° 61. $y = 1.6x + 3$

- 13.4 MIXED REVIEW** (p. 798) 65. 18 66. $\frac{21}{4}$ 67. -3
 68. -4 69. -3, 3 70. no solution 71. $\frac{1}{5}$ 72. $\frac{1}{3}$ 73. $\frac{1}{2}$
 74. $\frac{1}{3}$ 75. $\frac{11}{30}$ 76. $\frac{7}{30}$ 77. 0.4540 78. 0.3827 79. 0.3907
 80. 1.0642 81. 0.2126 82. -1.5890

- QUIZ 2** (p. 798) 1. $\sin \theta = -\frac{16\sqrt{337}}{337}$; $\cos \theta = -\frac{9\sqrt{337}}{337}$;
 $\tan \theta = \frac{16}{9}$; $\csc \theta = -\frac{\sqrt{337}}{16}$; $\sec \theta = -\frac{\sqrt{337}}{9}$; $\cot \theta = \frac{9}{16}$
 2. $\sin \theta = -\frac{2\sqrt{53}}{53}$; $\cos \theta = \frac{7\sqrt{53}}{53}$; $\tan \theta = -\frac{2}{7}$;
 $\csc \theta = -\frac{\sqrt{53}}{2}$; $\sec \theta = \frac{\sqrt{53}}{7}$; $\cot \theta = -\frac{7}{2}$ 3. $\sin \theta = \frac{5\sqrt{26}}{26}$;
 $\cos \theta = -\frac{\sqrt{26}}{26}$; $\tan \theta = -5$; $\csc \theta = \frac{\sqrt{26}}{5}$; $\sec \theta = -\sqrt{26}$;
 $\cot \theta = -\frac{1}{5}$ 4. $\sin \theta = -\frac{11\sqrt{157}}{157}$; $\cos \theta = \frac{6\sqrt{157}}{157}$;
 $\tan \theta = -\frac{11}{6}$; $\csc \theta = -\frac{\sqrt{157}}{11}$; $\sec \theta = \frac{\sqrt{157}}{6}$; $\cot \theta = -\frac{6}{11}$
 5. $\sin \theta = \frac{2\sqrt{5}}{5}$; $\cos \theta = \frac{\sqrt{5}}{5}$; $\tan \theta = 2$; $\csc \theta = \frac{\sqrt{5}}{2}$;
 $\sec \theta = \sqrt{5}$; $\cot \theta = \frac{1}{2}$ 6. $\sin \theta = \frac{\sqrt{17}}{17}$; $\cos \theta = -\frac{4\sqrt{17}}{17}$;
 $\tan \theta = -\frac{1}{4}$; $\csc \theta = \sqrt{17}$; $\sec \theta = -\frac{\sqrt{17}}{4}$; $\cot \theta = -4$
 7. $\sin \theta = -\frac{5\sqrt{106}}{106}$; $\cos \theta = \frac{9\sqrt{106}}{106}$; $\tan \theta = -\frac{5}{9}$;
 $\csc \theta = -\frac{\sqrt{106}}{5}$; $\sec \theta = \frac{\sqrt{106}}{9}$; $\cot \theta = -\frac{9}{5}$
 8. $\sin \theta = -\frac{8\sqrt{113}}{113}$; $\cos \theta = -\frac{7\sqrt{113}}{113}$; $\tan \theta = \frac{8}{7}$;
 $\csc \theta = -\frac{\sqrt{113}}{8}$; $\sec \theta = -\frac{\sqrt{113}}{7}$; $\cot \theta = \frac{7}{8}$ 9. $-\frac{\sqrt{2}}{2}$
 10. $-\sqrt{3}$ 11. $\frac{1}{2}$ 12. $\sqrt{3}$ 13. $-\frac{\sqrt{3}}{2}$ 14. $-\frac{\sqrt{3}}{2}$ 15. $-\frac{\sqrt{3}}{3}$
 16. $-\frac{1}{2}$ 17. 1.16; 66.5° 18. -0.644; -36.9° 19. 0.318; 18.2°
 20. 0.232; 13.3° 21. -1.33; -76.0° 22. 2.50; 143°
 23. 0.100; 5.74° 24. 1.47; 84.3° 25. 166° 26. 282°
 27. 262° 28. 206° 29. 253° 30. 103° 31. about 47 ft

- 13.5 PRACTICE** (pp. 803–806) 5. no triangle 7. two triangles
 9. $A \approx 35.8^\circ$; $B \approx 49.2^\circ$; $a = 14.7$ 11. 2.19 units^2
 13. 125 units^2 15. about \$62,400 17. no triangle
 19. two triangles 21. one triangle 23. no triangle
 25. $C = 75^\circ$; $a \approx 24.9$; $b \approx 30.5$ 27. $A \approx 84.7^\circ$; $C \approx 35.3^\circ$;
 $a \approx 34.5$ 29. no triangle 31. $A \approx 62.3^\circ$; $B \approx 22.7^\circ$; $b \approx 3.48$
 33. $A \approx 111.6^\circ$; $B \approx 52.4^\circ$; $a \approx 108$, or $A \approx 36.4^\circ$; $B \approx 127.6^\circ$;
 $a \approx 68.9$ 35. $A \approx 15.4^\circ$; $C \approx 129.6^\circ$ $c \approx 34.9$ 37. 119 units^2
 39. 17.3 units^2 41. 162 units^2 43. 9.83 units^2
 45. 67.1 units^2 47. 76.1 units^2 49. 9.06 units^2
 51. 85.7 units^2 53. *Sample answer:* Let the side lengths
 be 10 and 15. The equation is $A = 75 \sin x$. 55. 90°
 57. about 22.5 mi 61. 31.8° , or 8.2° 63. about 155.4 ft
 65. 21 bags 67. about 0.57 gal, so buy a single gallon can

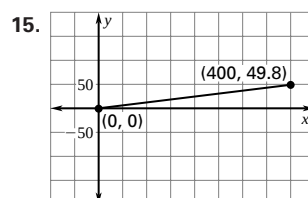
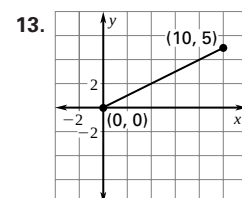
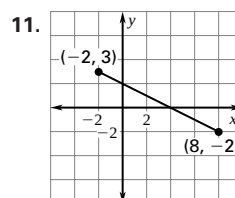
- 13.5 MIXED REVIEW** (p. 806) 71. $23\sqrt{3}$ 73. $8\sqrt{7}$
 75. $28\sqrt{2}$ 77. 0.3090 79. -0.2225 81. 0.5736 83. 0.9962

- 13.6 PRACTICE** (pp. 810–812) 5. $b \approx 43.0$; $A \approx 107.4^\circ$;
 $C \approx 52.7^\circ$ 7. $A \approx 82.2^\circ$; $B \approx 25.8^\circ$; $C \approx 72.0^\circ$
 9. 510 units^2 11. 1470 units^2 13. about 63.7 ft
 15. $c \approx 4.60$; $A \approx 35.2^\circ$; $B \approx 112.8^\circ$ 17. $c \approx 12.9$; $A \approx 48.6^\circ$;
 $B \approx 91.4^\circ$ 19. $c \approx 16.3$; $A \approx 37.7^\circ$; $B \approx 47.3^\circ$ 21. $A \approx 22.3^\circ$;
 $B \approx 49.5^\circ$; $C \approx 108.2^\circ$ 23. $a \approx 29.1$; $B \approx 63.4^\circ$; $C \approx 56.6^\circ$
 25. $c \approx 10.4$; $A = 75^\circ$; $B = 75^\circ$ 27. $b \approx 6.40$; $A \approx 150.9^\circ$;
 $C \approx 14.1^\circ$ 29. $A \approx 47.0^\circ$; $B \approx 27.8^\circ$; $C \approx 105.1^\circ$
 31. $A = 70^\circ$; $a \approx 32.4$; $c \approx 17.3$ 33. $a \approx 27.5$; $A \approx 56.5^\circ$;
 $B \approx 19.5^\circ$ 35. $A \approx 64.3^\circ$; $B \approx 73.2^\circ$; $C \approx 42.5^\circ$
 37. $c \approx 11.7$; $A \approx 20.0^\circ$; $B \approx 70.0^\circ$ 39. 14.0 units^2
 41. 150 units^2 43. 2210 units^2 45. 3.87 units^2
 47. 27.7 units^2 51. about 74.4 ft 53. about 7800 mi^2

- 13.6 MIXED REVIEW** (p. 812) 59. $\frac{y^2}{9} - \frac{x^2}{112} = 1$
 61. $y^2 - \frac{x^2}{19} = 1$ 63. 0.137 65. 0.160 67. 0.0130

13.7 PRACTICE (pp. 816–818)

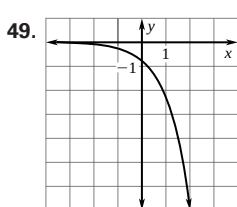
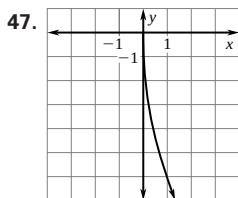
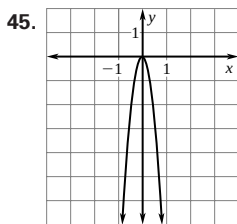
5.
 7. $y = \frac{3}{7}x - 2$; $0 \leq x \leq 35$
 9. $y = (\tan 72.1^\circ)x + 3$, or
 $y = 3.10x + 3$; $0 \leq x \leq 35.3$



17. $y = 2x - 5$; $1 \leq x \leq 6$
 19. $y = x$; $0 \leq x \leq 100$
 21. $x = (20.0 \cos 71.6^\circ)t$, or
 $x = 6.31t$;
 $y = (20.0 \sin 71.6^\circ)t$, or
 $y = 19.0t$; $0 \leq t \leq 3$

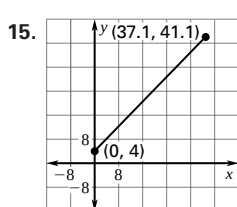
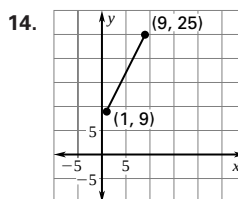
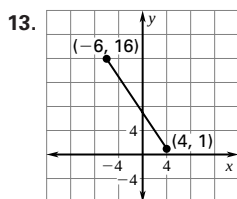
23. $x = (13.0 \cos 80.0^\circ)t + 3$, or $x = 2.26t + 3$;
 $y = (13.0 \sin 80.0^\circ)t + 2$, or $y = 12.8t + 2$; $0 \leq t \leq 5$
 25. $x = (10 \cos 143.13^\circ)t + 2.0$; $y = (10 \sin 143.13^\circ)t$
 27. about 3774 sec, or about 63 min 29. $x = 260t$;
 $y = 10,000 - 30t$ 31. about 333 sec, or 5 min 33 sec
 33. $x = (17.9 \cos 14.3^\circ)t$, or $x = 17.3t$; $y = -4.9t^2 +$
 $(17.9 \sin 14.3^\circ)t + 1.71$, or $y = -4.9t^2 + 4.42t + 1.71$
 35. about 20.7 m 37. about 1.49 sec 39. $x = (v \cos 43^\circ)t$,
 or $x = 0.731vt$; $y = -16t^2 + (v \sin 43^\circ)t + 6$, or
 $y = -16t^2 + 0.682vt + 6$

13.7 MIXED REVIEW (p. 819)



51. 6930 53. $-\frac{1}{9}$
 55. 0.3413 57. 0.0013

- QUIZ 3 (p. 819)** 1. $A \approx 58.5^\circ$; $C \approx 51.5^\circ$; $a \approx 27.2$
 2. $A = 70^\circ$; $b \approx 2.77$; $c \approx 15.7$ 3. $C = 30^\circ$; $a \approx 20.5$; $c \approx 16.0$
 4. no triangle 5. $A \approx 106.1^\circ$; $B \approx 43.1^\circ$; $C \approx 30.8^\circ$
 6. $a = 35.4$; $B = 23.9^\circ$; $C = 49.1^\circ$ 7. 179 units²
 8. 499 units² 9. 57.0 units² 10. 16.3 units²
 11. 1950 units² 12. 334 units²



16. $y = -\frac{1}{5}x - \frac{27}{5}$; $-22 \leq x \leq 3$
 17. $y = 0.700x$; $0 \leq x \leq 246$
 18. about 23.0 ft

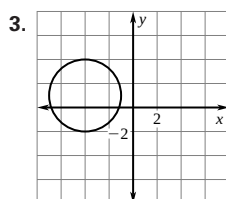
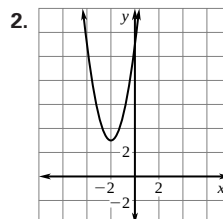
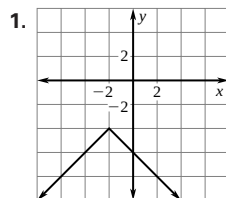
TECHNOLOGY ACTIVITY 13.7 (p. 820) 1. 390; 423; 443;
 443; 423; 390 2. 45° ; the results look to be symmetric
 around the value $\theta = 45^\circ$, with a maximum at that angle.

CHAPTER REVIEW (pp. 822–824) 1. $\sin \theta = \frac{3}{5}$; $\cos \theta = \frac{4}{5}$;
 $\tan \theta = \frac{3}{4}$; $\csc \theta = \frac{5}{3}$; $\sec \theta = \frac{5}{4}$; $\cot \theta = \frac{4}{3}$

3. $\sin \theta = \frac{\sqrt{2}}{2}$; $\cos \theta = \frac{\sqrt{2}}{2}$; $\tan \theta = 1$; $\csc \theta = \sqrt{2}$;
 $\sec \theta = \sqrt{2}$; $\cot \theta = 1$ 5. $\frac{\pi}{6}$ 7. $-\frac{\pi}{12}$ 9. 300° 11. $\frac{5\pi}{2}$ ft,
 $\frac{25\pi}{4}$ ft² 13. $\frac{56\pi}{3}$ cm, $\frac{448\pi}{3}$ cm² 15. $\frac{\sqrt{3}}{2}$ 17. $\frac{1}{2}$ 19. $\frac{\pi}{4}$, 45°
 21. $\frac{\pi}{2}$, 90° 23. $\frac{2\pi}{3}$, 120° 25. $A = 29.3^\circ$; $C = 132.7^\circ$;
 $c = 28.5$ or $A = 150.7^\circ$; $C = 11.3^\circ$; $c = 7.60$ 27. 63.1 units²
 29. 98.3 units² 31. $C = 107^\circ$, $A = 24^\circ$, $B = 49^\circ$ 33. 9.9 units²
 35. 46.4 units² 39. $y = -2x - 1$; $-3 \leq x \leq 13$

CHAPTER 14

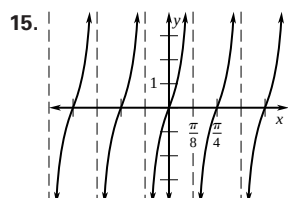
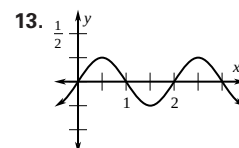
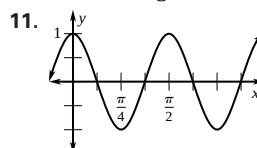
SKILL REVIEW (p. 830)



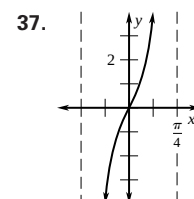
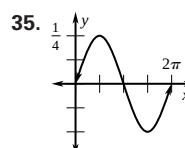
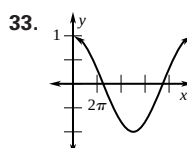
4. -8, 1 5. $\pm \frac{5}{3}$ 6. $\frac{1}{6} \pm \frac{\sqrt{61}}{6}$
 7. $\frac{\sqrt{3}}{2}$ 8. $\frac{\sqrt{3}}{3}$ 9. $\frac{\sqrt{2}}{2}$ 10. 0

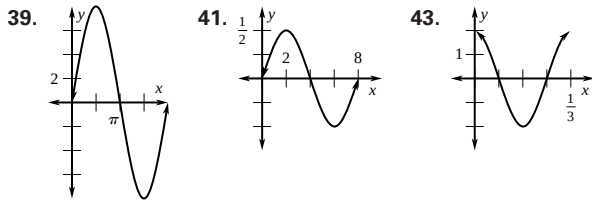
11. $\frac{\pi}{4}$, 45° 12. $\frac{\pi}{6}$, 30° 13. $\frac{\pi}{2}$, 90° 14. $-\frac{\pi}{3}$, -60°

14.1 PRACTICE (pp. 835–837) 5. amplitude: 3, period: 2
 7. amplitude: $\frac{2}{3}$, period: 6 9. amplitude: 1, period: 4π



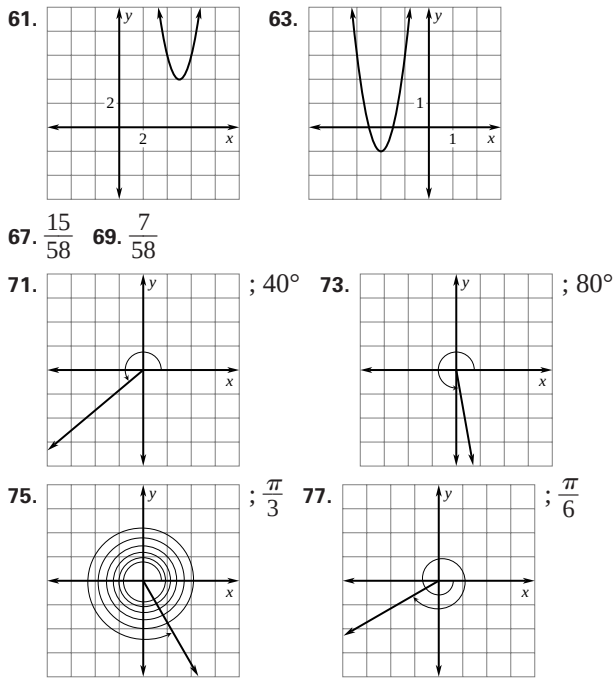
17. B 19. D 21. A
 23. amplitude: 1, period: 6π
 25. amplitude: 4, period: π
 27. amplitude: 1, period: π
 29. amplitude: 5, period: 4π
 31. amplitude: $\frac{1}{3}$, period: $\frac{1}{2}$





45. $y = 10 \sin \frac{\pi x}{2}$ 47. $y = \frac{1}{2} \sin \frac{2}{3}x$ 49. $y = 3 \sin 4\pi x$
 53. amplitude: $\frac{1}{2}$ ft, period: $\frac{\pi}{3}$ sec 55. 8.7 ft, 8.9 ft, 9.2 ft;
 $h_t - h_{t-1}$ increases as t increases.

14.1 MIXED REVIEW (p. 837)

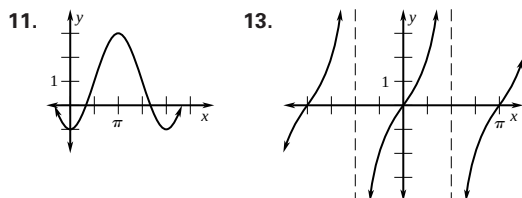


79. 46.2 years

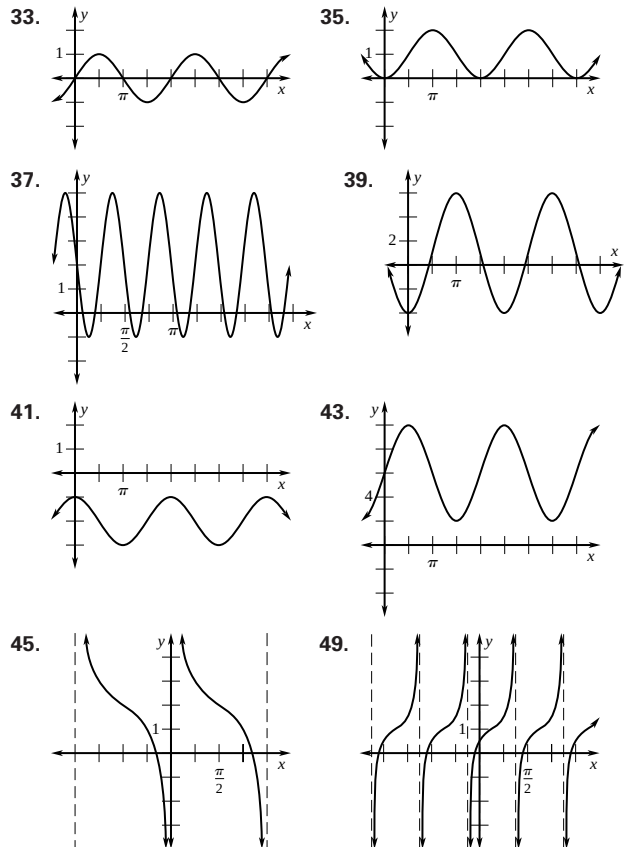
TECHNOLOGY ACTIVITY 14.1 (p. 838) 1. amplitude: $\frac{1}{3}$, 3, 9;
 period: 2π 3. amplitude: $\frac{1}{2}$, 1, 2; period: 2π

5. amplitude: 1; period: 2π , π , $\frac{\pi}{2}$
 7. amplitude: 1; period: 4π , 2π , π

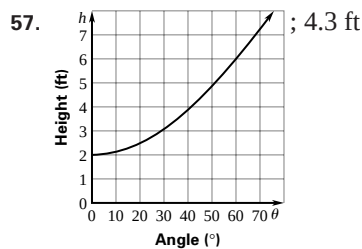
14.2 PRACTICE (pp. 844–846) 1. translation 3. shifted right
 π units 5. horizontal shift 7. horizontal shift
 9. reflection, vertical shift

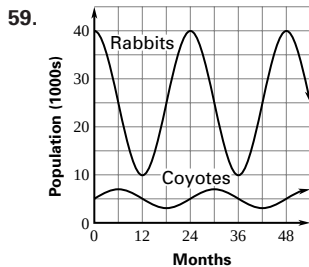


- 15.
17. shift up 2 19. shift down 2
 21. reflect in x-axis and shift left π 23. reflect in x-axis,
 shift right $\frac{\pi}{4}$, shift up 5
 25. shift left $\frac{3\pi}{4}$, shift up 3
 27. B 29. A 31. D



51. $y = 3 \cos (x + \pi) + 3$ 53. $y = -\frac{1}{3} \sin 6x - 1$
 55. $y = -4 \tan \frac{\pi}{2} \left(x - \frac{1}{2} \right) + 6$

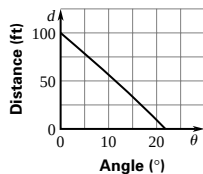




; Over the course of the first year, R falls while C rises and then falls. Over the second year, R rises while C continues to fall and then rise. Both populations have the same period, 2 years, with the peak in R occurring

6 months before the peak in C , and the minimum in R 6 months before the minimum in C .

61. $d = -250 \tan \theta + 100$, where $0 \leq \theta \leq 21.8^\circ$;



14.2 MIXED REVIEW (p. 847) 65. ellipse, $\frac{x^2}{25} + \frac{y^2}{36} = 1$

67. circle, $x^2 + y^2 = 25$ 69. 8 71. 120 73. 10 75. 7

77. $\sin \theta = \frac{4}{5}$, $\cos \theta = \frac{3}{5}$, $\tan \theta = \frac{4}{3}$, $\sec \theta = \frac{5}{3}$,

$\csc \theta = \frac{5}{4}$, $\cot \theta = \frac{3}{4}$ 79. $\sin \theta = \frac{3}{10}$, $\cos \theta = \frac{\sqrt{91}}{10}$,

$\tan \theta = \frac{3\sqrt{91}}{91}$, $\sec \theta = \frac{10\sqrt{91}}{91}$, $\csc \theta = \frac{10}{3}$, $\cot \theta = \frac{\sqrt{91}}{3}$

81. $\sin \theta = \frac{2\sqrt{6}}{5}$, $\cos \theta = \frac{1}{5}$, $\tan \theta = 2\sqrt{6}$, $\sec \theta = 5$,

$\csc \theta = \frac{5\sqrt{6}}{12}$, $\cot \theta = \frac{\sqrt{6}}{12}$ 83. 40,320

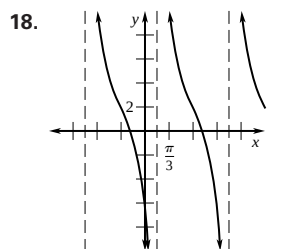
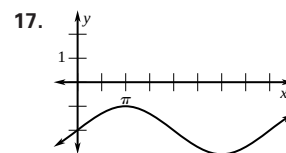
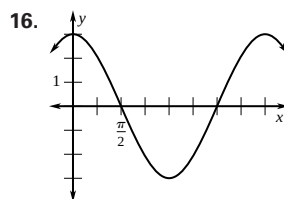
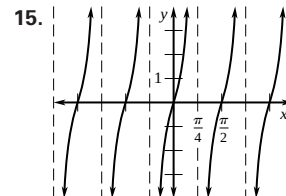
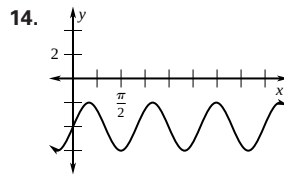
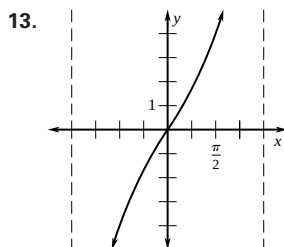
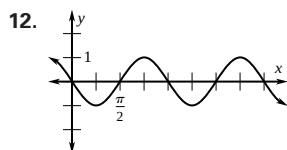
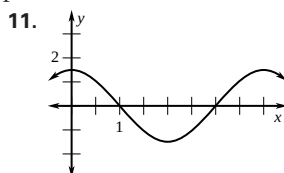
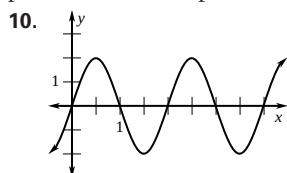
QUIZ 1 (p. 847) 1. amplitude: $\frac{5}{2}$, period: $\frac{2\pi}{7}$ 2. amplitude: 1,

period: π 3. amplitude: 1, period: 4 4. amplitude: $\frac{1}{4}$,

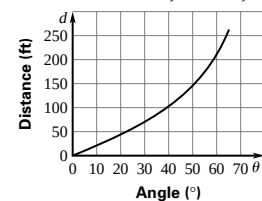
period: 1 5. amplitude: 3, period: 2 6. amplitude: 4,

period: $\frac{4}{3}$ 7. amplitude: $\frac{7}{3}$, period: $\frac{\pi}{2}$ 8. amplitude: $\frac{1}{3}$,

period: 2π 9. amplitude: 6, period: 16π



19. $d = 120 \tan \theta$
 $0^\circ \leq \theta \leq 65.2^\circ$; 30.3° ;



14.3 PRACTICE (pp. 852–854) 5. $\sin \theta = \frac{4}{5}$, $\tan \theta = -\frac{4}{3}$,

$\sec \theta = -\frac{5}{3}$, $\csc \theta = \frac{5}{4}$, $\cot \theta = -\frac{3}{4}$ 7. $\sin \theta = -\frac{\sqrt{7}}{4}$, $\cos \theta = \frac{3}{4}$,

$\tan \theta = -\frac{\sqrt{7}}{3}$, $\csc \theta = -\frac{4\sqrt{7}}{7}$, $\cot \theta = -\frac{3\sqrt{7}}{7}$ 9. $\tan x$ 11. 1

13. $\cot x \tan(-x) = \frac{\cos x}{\sin x} \cdot \frac{\sin(-x)}{\cos(-x)} = \frac{\cos x}{\sin x} \cdot \frac{-\sin x}{\cos x} = -1$

15. ellipse 17. $\sin \theta = \frac{3\sqrt{73}}{73}$, $\cos \theta = \frac{8\sqrt{73}}{73}$, $\sec \theta = \frac{\sqrt{73}}{8}$,

$\csc \theta = \frac{\sqrt{73}}{3}$, $\cot \theta = \frac{8}{3}$ 19. $\cos \theta = -\frac{4}{5}$, $\tan \theta = -\frac{3}{4}$,

$\sec \theta = -\frac{5}{4}$, $\csc \theta = \frac{5}{3}$, $\cot \theta = -\frac{4}{3}$ 21. $\sin \theta = \frac{\sqrt{23}}{12}$,

$\tan \theta = -\frac{\sqrt{23}}{11}$, $\sec \theta = -\frac{12}{11}$, $\csc \theta = \frac{12\sqrt{23}}{23}$,

$\cot \theta = -\frac{11\sqrt{23}}{23}$ 23. $\sin \theta = -\frac{\sqrt{91}}{10}$, $\cos \theta = -\frac{3}{10}$,

$\tan \theta = \frac{\sqrt{91}}{3}$, $\csc \theta = -\frac{10\sqrt{91}}{91}$, $\cot \theta = \frac{3\sqrt{91}}{91}$

25. $\sin \theta = -\frac{\sqrt{3}}{2}$, $\cos \theta = \frac{1}{2}$, $\tan \theta = -\sqrt{3}$, $\csc \theta = -\frac{2\sqrt{3}}{3}$,

$\cot \theta = -\frac{\sqrt{3}}{3}$ 27. $\sin \theta = -\frac{1}{2}$, $\cos \theta = \frac{\sqrt{3}}{2}$, $\tan \theta = -\frac{\sqrt{3}}{3}$,

$\sec \theta = \frac{2\sqrt{3}}{3}$, $\csc \theta = -2$ 29. $-\cot x$ 31. $\csc x$

33. $\cos x$ 35. $\cos^2 x - \sin^2 x$ 37. 1 39. -1 41. $\sin x$

43. -1 45. $\tan x \csc x \cos x = \left(\frac{\sin x}{\cos x}\right)\left(\frac{1}{\sin x}\right) \cos x = 1$

47. $2 - \sec^2 x = 1 + (1 - \sec^2 x) = 1 - \tan^2 x$

49. $\frac{\cos^2 x + \sin^2 x}{1 + \tan^2 x} = \frac{1}{\sec^2 x} = \cos^2 x$

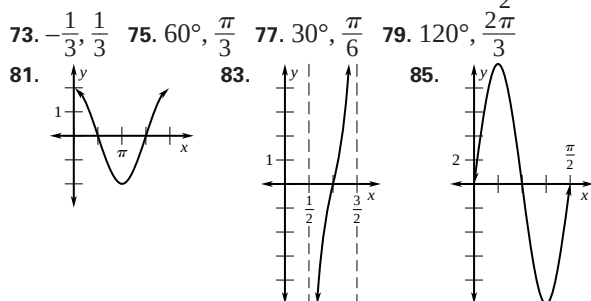
51. $\frac{\sin\left(\frac{\pi}{2} - x\right) - 1}{1 - \cos(-x)} = \frac{\cos x - 1}{1 - \cos x} = -1$

53. $\frac{\cos(-x)}{1 + \sin(-x)} = \frac{\cos x}{1 - \sin x} = \frac{\cos x(1 + \sin x)}{1 - \sin^2 x} = \frac{\cos x(1 + \sin x)}{\cos^2 x} = \sec x + \tan x$ 55. $1 = \sec^2 t - \tan^2 t = \frac{x^2}{5} - \frac{y^2}{1}$, hyperbola 57. $1 = \sin^2 \pi t + \cos^2 \pi t = \frac{y^2}{64} + \frac{x^2}{64}$, circle 59. $1 = \sin^2 \frac{t}{2} + \cos^2 \frac{t}{2} = \frac{y^2}{16} + \frac{x^2}{1}$, ellipse

61. $s = \frac{h \sin(90^\circ - \theta)}{\sin \theta} = \frac{h \cos \theta}{\sin \theta} = h \cot \theta$

63. Actual wheel is 18 ft wide, model is 1 ft wide. Actual wheel rotates once every 15 sec, model once every 8 sec.

14.3 MIXED REVIEW (p. 854) 69. $-9, 4$ 71. $-\frac{3}{2}, 5$



14.4 PRACTICE (pp. 859–860) 5. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$ 7. $\frac{\pi}{6}, \frac{11\pi}{6}$

9. $0.45 + 2n\pi, 2.69 + 2n\pi$ 11. $\frac{7\pi}{6} + 2n\pi, \frac{11\pi}{6} + 2n\pi$

13. yes 15. yes 17. yes 19. $\frac{\pi}{3} + 2n\pi, \frac{5\pi}{3} + 2n\pi$

21. $\frac{\pi}{6} + 2n\pi, \frac{5\pi}{6} + 2n\pi$ 23. $\frac{\pi}{4} + \frac{n\pi}{2}$ 25. $\frac{\pi}{2} + n\pi$

27. $\frac{\pi}{2} + 2n\pi, \frac{7\pi}{6} + 2n\pi, \frac{11\pi}{6} + 2n\pi$

29. $\frac{\pi}{2} + 2n\pi, \frac{11\pi}{6} + 2n\pi$ 31. $\frac{\pi}{3} + 2n\pi, \frac{5\pi}{3} + 2n\pi$

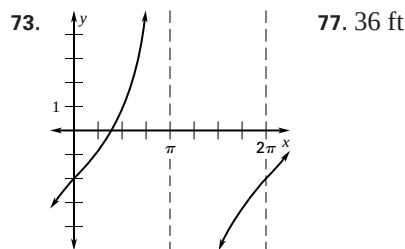
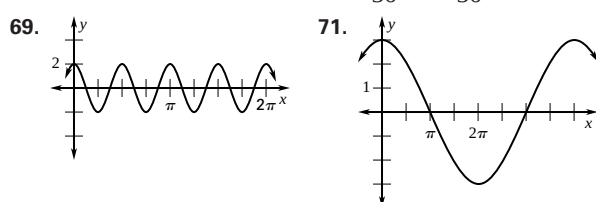
33. 0.93, 5.36 35. $\frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$ 37. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$

39. $\frac{\pi}{4}, \frac{7\pi}{4}$ 41. $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$ 43. 1.33, 4.47 45. 4.13, 5.30

47. $\frac{7\pi}{6}, \frac{11\pi}{6}$ 49. 0, π 51. $\frac{\pi}{6}, \frac{2\pi}{3}, \frac{7\pi}{6}, \frac{5\pi}{3}$

53. $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$ 55. $\frac{\pi}{3}, \frac{5\pi}{3}$ 57. highs: 6:12 A.M. and 6:36 P.M., lows: 12:00 A.M. and 12:24 P.M., the water depth never goes below 7 ft. 59. June, July, August; no

14.4 MIXED REVIEW (p. 861) 65. $\frac{33}{36}$ 67. $\frac{33}{36}$



14.5 PRACTICE (pp. 865–867) 5. $y = \cos \pi x - 2$

7. $y = 3 \sin \frac{x}{2} + 7$ 9. $h = -20 \cos \left(\frac{2\pi}{15} t \right) + 25$

11. $y = 5 \sin 2x$ 13. $y = -4 \cos \pi x$ 15. $y = 2 \cos \frac{\pi x}{2} - 4$

17. $y = 8 \sin \frac{x}{2}$ 19. $y = -\cos 3x + 3$ 21. $y = -5 \sin \frac{\pi x}{2} + 2$

23. $y = -6 \cos 6x + 5$ 25. $y = 4 \cos \frac{x}{3} - 4$

27. $y = -2 \sin 6x - 4$ 31. $h = 6.5 \cos 60\pi t + 4.5$

33. $h = -2.5 \cos \pi t + 6.5$

35. $T = 776.4 \cdot \sin \left(0.45t + 1.49 \right) + 727.7$

14.5 MIXED REVIEW (p. 867) 41. $\frac{1}{36}$ 43. $\frac{1}{4}$ 45. $-\frac{\sqrt{2}}{2}$

47. $-\frac{1}{2}$ 49. $-\frac{\sqrt{3}}{3}$ 51. 9.92 53. 22.19 55. 31.53

QUIZ 2 (p. 868) 1. $\csc x$ 2. $2 \cos^2 x$ 3. $\sin x \cos x$

4. $\frac{\pi}{6} + \pi n, \frac{5\pi}{6} + \pi n$ 5. $5.94 + 2\pi n, 3.48 + 2\pi n$

6. $\frac{2\pi}{3} + \pi n, \frac{5\pi}{6} + \pi n$ 7. $y = -5 \sin 2x$ 8. $y = \cos \frac{x}{3} + 2$

9. $y = -2 \cos x + 4$ 10. $T = 25.0 \sin(0.50t - 1.76) + 47.3$

14.6 PRACTICE (pp. 872–874) 5. $\frac{\sqrt{6} - \sqrt{2}}{4}$ 7. $-\frac{\sqrt{2} + \sqrt{6}}{4}$

9. $-2 - \sqrt{3}$ 11. none 13. $\frac{\pi}{3}, \frac{4\pi}{3}$ 15. 0 17. $-\frac{\sqrt{3}}{2}$

19. 1 21. $-\frac{\sqrt{2}}{2}$ 23. $-2 + \sqrt{3}$ 25. $\frac{\sqrt{2} - \sqrt{6}}{4}$ 27. $-2 - \sqrt{3}$

29. $-\frac{36 + \sqrt{627}}{70}$ 31. $\frac{\sqrt{627} + 36}{4\sqrt{19} - 9\sqrt{33}}$ 33. $-\frac{9\sqrt{33} + 4\sqrt{19}}{70}$

35. $\frac{4\sqrt{11} - 15}{30}$ 37. $\frac{4\sqrt{11} - 15}{3\sqrt{11} + 20}$ 39. $\frac{20 - 3\sqrt{11}}{30}$ 41. $\tan x$

43. $-\sin x$ 45. $-\cos x$ 47. $-\sin x$ 49. $\frac{3\pi}{2}$ 51. 0, π

53. 0, $\frac{\pi}{3}, \frac{5\pi}{3}$ 55. 36.9° 57. $P = \frac{1}{40} \cos 1100t$

59. $0.26 + \frac{n\pi}{10}$

14.6 MIXED REVIEW (p. 874) 65. $\begin{bmatrix} 3 & 3 & 3 \\ -1 & -1 & -1 \end{bmatrix}$ 67. $\begin{bmatrix} -15 \\ 13 \end{bmatrix}$

69. $\begin{bmatrix} 30 & 10 & -10 \\ -70 & -20 & 30 \end{bmatrix}$ 71. $C = 134^\circ, a = 65.8, c = 153$

73. $A = 111^\circ, B = 17^\circ, C = 52^\circ$ 75. $\frac{2\pi}{3}, \frac{5\pi}{3}$ 77. $\frac{3\pi}{4}, \frac{7\pi}{4}$

14.7 PRACTICE (pp. 879–881) 5. $-\sqrt{\frac{29 - 5\sqrt{29}}{58}}$ 7. $\frac{20}{29}$ 9. $\frac{20}{21}$

11. $2 \cos x - 2 \cos^2 x$ 13. $\frac{2 \tan x}{1 - \tan^4 x}$ 15. $-2 \cos^2 x$

17. $2 - \sqrt{3}$ 19. $1 - \sqrt{2}$ 21. $-(2 + \sqrt{3})$

23. $-\left(\frac{\sqrt{2+\sqrt{3}}}{2}\right)$ 25. $\frac{\sqrt{2-\sqrt{3}}}{2}$

27. $\sin \frac{u}{2} = \frac{\sqrt{6}}{6}$, $\cos \frac{u}{2} = -\frac{\sqrt{30}}{6}$, $\tan \frac{u}{2} = -\frac{\sqrt{5}}{5}$

29. $\sin \frac{u}{2} = \frac{\sqrt{5}}{5}$, $\cos \frac{u}{2} = -\frac{2\sqrt{5}}{5}$, $\tan \frac{u}{2} = -\frac{1}{2}$

31. $\sin 2x = -\frac{4}{5}$, $\cos 2x = \frac{3}{5}$, $\tan 2x = -\frac{4}{3}$

33. $\sin 2x = -\frac{24}{25}$, $\cos 2x = \frac{7}{25}$, $\tan 2x = -\frac{24}{7}$ 35. $2 \cos x$

37. $1 - 5 \sin^2 x$ 39. $\frac{1}{1 + \cos x}$ 41. $2 \sin x \cos x$

43. $(\sin x + \cos x)^2 = \sin^2 x + \cos^2 x + 2 \sin x \cos x = 1 + \sin 2x$ 45. $\cos \theta + 2 \sin^2 \frac{\theta}{2} = \cos \theta + 2 \left(\frac{1 - \cos \theta}{2} \right) = \cos \theta + 1 - \cos \theta = 1$ 47. $\cos 3x = \cos (2x + x) = \cos 2x \cos x - \sin 2x \sin x = \cos x (\cos^2 x - \sin^2 x) - \sin x (2 \sin x \cos x) = \cos^3 x - 3 \sin^2 x \cos x$

49. $\cos^2 2x - \sin^2 2x = \cos 4x$ 51. no solution

53. $0, \frac{\pi}{4}, \frac{3\pi}{4}, \pi, \frac{5\pi}{4}, \frac{7\pi}{4}$ 55. $0, \pi$ 57. 0.21, 1.38, 3.36, 4.50

59. $0, \pi$ 61. $n\pi, \frac{2\pi}{3} + 2n\pi, \frac{4\pi}{3} + 2n\pi$ 63. $\pi + 2n\pi, \frac{\pi}{3} + 4n\pi, \frac{5\pi}{3} + 4n\pi$ 65. $\frac{3\pi}{2} + 2n\pi, \frac{7\pi}{6} + 2n\pi, \frac{11\pi}{6} + 2n\pi$

67. $\tan \frac{u}{2} = \frac{1 - \cos u}{\sin u} = \frac{(1 - \cos u)(1 + \cos u)}{\sin u (1 + \cos u)} = \frac{1 - \cos^2 u}{\sin u (1 + \cos u)} = \frac{\sin^2 u}{\sin u (1 + \cos u)} = \frac{\sin u}{1 + \cos u}$

69. $y_{\max} = \frac{1}{64} v^2 \sin^2 \theta$ 71. $A = 324 \sin \frac{\theta}{2} \cos \frac{\theta}{2}$

73. $n = \frac{\sqrt{3}}{2} + \frac{1}{2} \cot \frac{\theta}{2}; 77^\circ$

14.7 MIXED REVIEW (p. 882) 79. $f(x) - g(x) = -2x + 1$, all real numbers 81. $f(x) \div g(x) = \frac{4x+1}{6x}$, all real numbers except $x = 0$ 83. $g(f(x)) = 24x + 6$, all real numbers

85. 0.137 87. 0.1601 89. 0.013 91. $-\sin x$ 93. $-\cos x$

95. $\frac{\tan x + 1}{1 - \tan x}$

QUIZ 3 (p. 882) 1. $\frac{\sqrt{2+\sqrt{3}}}{2}$ 2. $\frac{\sqrt{6}-\sqrt{2}}{4}$ 3. $-2 + \sqrt{3}$

4. $-\frac{\sqrt{6}+\sqrt{2}}{4}$ 5. $-\frac{\sqrt{6}+\sqrt{2}}{4}$ 6. $-2 + \sqrt{3}$ 7. $\frac{\sqrt{18+12\sqrt{2}}}{6}$

8. $\frac{\sqrt{18+12\sqrt{2}}}{6}$ 9. $\frac{\sqrt{3+2\sqrt{2}}}{\sqrt{3-2\sqrt{2}}}$ 10. $-\frac{4\sqrt{2}}{9}$ 11. $\frac{7}{9}$ 12. $-\frac{4\sqrt{2}}{7}$

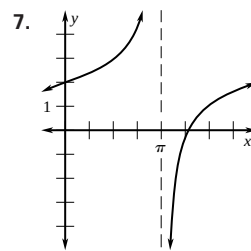
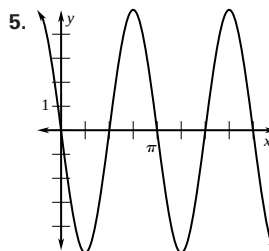
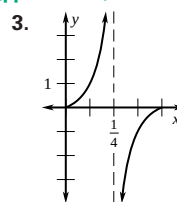
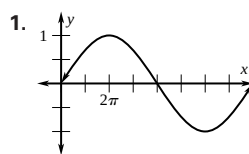
13. $-\sin x$ 14. $-\cos x$ 15. $\frac{\tan x + 1}{1 - \tan x}$ 16. $\sin x$ 17. 1

18. $\frac{\tan x}{1 + \tan x}$ 19. $\frac{\pi}{18} + \frac{2n\pi}{3}, \frac{5\pi}{18} + \frac{2n\pi}{3}$ 20. $n\pi$

21. $n\pi, \frac{2\pi}{3} + 2n\pi, \frac{4\pi}{3} + 2n\pi$ 22. $\frac{3\pi}{8} + \frac{n\pi}{2}$

23. 77 ft

CHAPTER 14 REVIEW (pp. 884–886)



9. 1

11. $\sin^2(-x) = \sin^2 x$
 $= \frac{\sin^2 x}{\cos^2 x} \cos^2 x$
 $= \frac{\tan^2 x}{\sec^2 x}$
 $= \frac{\tan^2 x}{1 + \tan^2 x}$

Negative angle identity

Multiply by $\frac{\cos^2 x}{\cos^2 x}$.

Identities

Pythagorean identity

13. $\frac{\pi}{4} + \frac{n\pi}{2}, n\pi$ 15. $\frac{\pi}{2} + 2n\pi$ 17. $\frac{\pi}{6} + 2n\pi, \frac{5\pi}{6} + 2n\pi$

19. $y = 2 \sin x$ 21. $y = \cos 2x$ 23. $-\frac{\sqrt{6}+\sqrt{2}}{4}$ 25. $-2 - \sqrt{3}$

27. $-2 + \sqrt{3}$ 29. $-\frac{\sqrt{2}-\sqrt{2}}{2}$ 31. 0

CUMULATIVE PRACTICE (pp. 890–891)

1. $y = -2x + 7$
 3. $x = 4$ 5. $(10, 4, -4)$ 7. $\begin{bmatrix} 11 & -8 \\ -14 & 9 \end{bmatrix}$ 9. $\begin{bmatrix} -\frac{3}{2} & 1 \\ -18 & 8 \end{bmatrix}$

11. $2x^3 - 5x^2 - 13x + 4$ 13. $\frac{x}{4x^2 - 19x - 30}$

15. $\frac{4x^2 + 27x + 7}{x^2 - 49}$ 17. $\frac{1}{5}$ 19. -1 21. -4 23. 7 25. 0

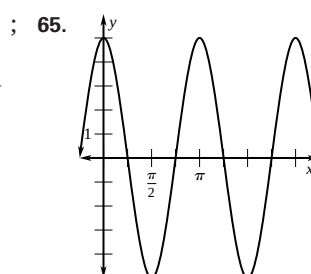
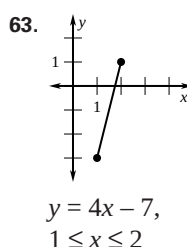
27. 5.39, (-2.5, 1) 29. 9.90, (3.5, 0.5) 31. $\frac{1}{2}, 2^{4-n}$

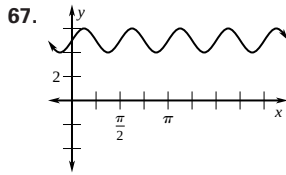
33. 14, $5n - 11$ 35. 40 37. $\frac{3}{2}$ 39. 90 41. 8 43. 35

45. 28.3 in.; 84.82 in.² 47. $\frac{\sqrt{3}}{3}$ 49. 1 51. $\frac{1}{2}$ 53. $\frac{\pi}{6}, 30^\circ$

55. $\frac{3\pi}{4}, 135^\circ$ 57. $B = 31^\circ, C = 84^\circ, c = 7.68$

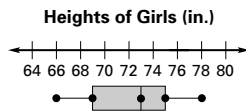
59. $A = 92^\circ, B = 64^\circ, C = 24^\circ$ 61. 336.7





81. mean: 72.4; median: 73;
modes: 76, 74; range: 12;
standard deviation: 3.7;
83. 953 ft

69. $\tan^3 x$ 71. $-\csc x$
73. $\frac{\pi}{2} + n\pi$ 75. $-\frac{\sqrt{2} + \sqrt{6}}{4}$
77. $-2 - \sqrt{3}$ 79. $-\frac{\sqrt{2} + \sqrt{6}}{4}$



SKILLS REVIEW HANDBOOK

OPERATIONS WITH SIGNED NUMBERS (p. 905) 1. -2 3. 0
5. -1 7. 6 9. -10 11. -21 13. 6 15. -4 17. 9 19. -5
21. -3 23. 15 25. 24 27. -24 29. 30 31. 25 33. -5
35. 8 37. -4 39. 3 41. -20 43. -2 45. -3 47. 29 49. -7
51. 135 53. -35 55. -3 57. 7 59. -7 61. -9 63. 132

CONVERTING DECIMALS, FRACTIONS, AND PERCENTS
(p. 906) 1. 20% 3. 55% 5. 87% 7. 40% 9. 60% 11. 0.5
13. 0.02 15. 0.4 17. 0.36 19. 1.5

CALCULATING PERCENTS (p. 907) 1. 3 3. 0.3 5. 30
7. 0.54 9. 12 11. 0.00375 13. 0.025 15. 0.084 17. 14
19. 0.005 21. 50% 23. 100% 25. 35% 27. about 22%
29. about 2.4% 31. 20% 33. 0.2% 35. 0.44%

LEAST COMMON DENOMINATOR (p. 909) 1. $2 \times 2 \times 2$
3. $2 \times 2 \times 2 \times 2 \times 2 \times 2$ 5. prime 7. $2 \times 2 \times 3$
9. 2×11 11. prime 13. prime 15. 5×5 17. 1, 28
19. 2, 60 21. 20, 40 23. 6, 72 25. 12, 144 27. 1, 6
29. 6, 18 31. 48 33. 26 35. 10 37. 12 39. 60 41. 12
43. 120 45. 12 47. 60 49. 60 51. $\frac{19}{24}$ 53. $-\frac{5}{4}$ 55. $-\frac{1}{10}$
57. $\frac{33}{80}$ 59. $\frac{13}{12}$ 61. $-\frac{111}{66}$ 63. $\frac{1}{2}$ 65. $-\frac{1}{20}$ 67. $\frac{7}{6}$ 69. $\frac{1}{3}$

WRITING RATIOS AND SOLVING PROPORTIONS (p. 910)

1. 4:5, $\frac{4}{5}$ 3. 2:6, $\frac{2}{6}$ 5. 1 to 5, 1:5 7. 8 to 5, 8:5
9. 3 to 1, $\frac{3}{1}$ 11. 3 to 4, 3:4 13. 1 to 4 15. 1:4 17. $\frac{1}{5}$
19. 5 to 3 21. $\frac{3}{5}$ 23. $\frac{4}{3}$ 25. 1 27. 16 29. 3 31. 21
33. 5 35. 27 37. 18 39. 20 41. 16 43. 8 45. 6 47. 1

SIGNIFICANT DIGITS (p. 912) 1. 8200 3. 9.50 5. 28.15
7. 700 9. 10 11. 0.74 13. 3.2 15. 1.0 17. 200 19. 24.7
21. 17.7 23. 89 25. 0.723 27. 0.06 29. 16,000
31. \$7.50 33. \$239.70 35. 13 mi/gal
37. 100 gal of milk 39. 230 mL 41. 730 computers/store
43. 15 mg 45. 25.9 in. of rain

SCIENTIFIC NOTATION (p. 913) 1. 4×10^{-1} 3. 9×10^{-2}
5. 4×10^0 7. 9.26×10^{-5} 9. 2.11111×10^2 11. 5×10^{-3}
13. 9.84×10^4 15. 2.0489×10^2 17. 3.7×10^{-4}
19. 5.98×10^1 21. 2.30856×10^7 23. 1.00×10^{-4}
25. 900 27. 3100 29. 0.290 31. 10,010 33. 7,926,000
35. 0.000384 37. 0.000037 39. 0.0049831 41. 395,020
43. 2640.95 45. 0.000455 47. 0.059438

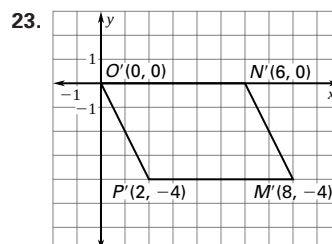
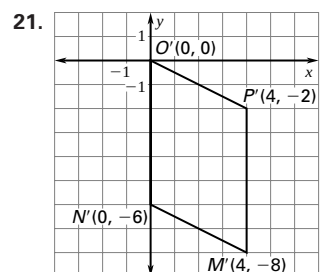
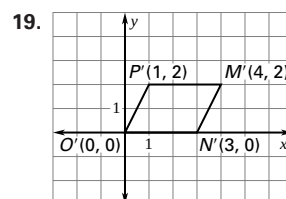
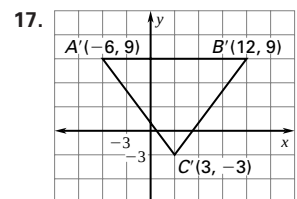
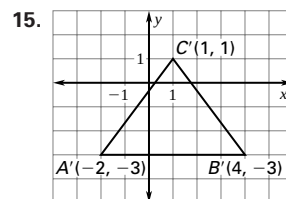
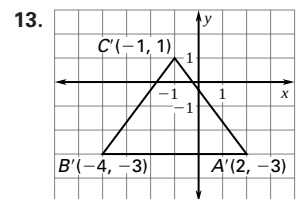
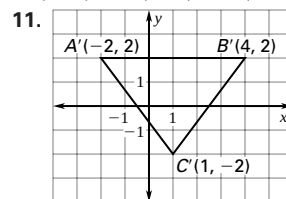
PERIMETER, AREA, AND VOLUME (p. 916) 1. about 6.28 m
3. 8 in. 5. 13 m 7. 12 ft 9. 22 cm 11. 18 cm 13. about
69 in. 15. 81 in.^2 17. 21 cm^2 19. 24 in.^2 21. about
 0.79 in.^2 23. 12 mi^2 25. 10 in.^2 27. 88 ft^2 29. about
 63 mm^2 31. 201 in.^2 33. 288 cm^2 35. 1000 cm^3
37. 12 yd^3 39. 5 ft^3 41. about 127 in.^3 43. 38.4 m^3

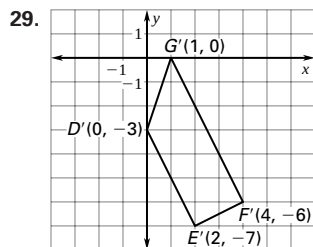
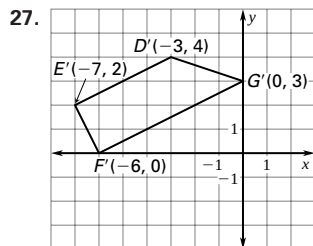
TRIANGLE RELATIONSHIPS (p. 918) 1. 45 3. 76 5. 165
7. 60 9. yes 11. no 13. no 15. no 17. no 19. yes 21. yes
23. yes 25. about 5.7 mm 27. 2.5 m 29. about 3.6 m
31. 8 cm 33. about 7.1 in. 35. yes 37. no 39. yes 41. yes
43. no 45. yes

SYMMETRY (p. 920) 1. line symmetry: 4 lines of symmetry;
rotational symmetry: 90° or 180° in either direction
3. line symmetry: 6 lines of symmetry; rotational
symmetry: 60° , 120° , or 180° in either direction
5. line symmetry: 5 lines of symmetry; rotational
symmetry: 72° or 144° in either direction 7. no line or
rotational symmetry 9. (-3, 2) 11. (4, 1) 13. (4, 6)

TRANSFORMATIONS (p. 922) 1. (-3, -6) 3. $(\frac{9}{2}, -9)$

5. (6, 3) 7. (3, 6) 9. (0, -1)





SIMILAR FIGURES (p. 923) 1. 2.5 3. 1 5. 70 7. 3.75

LOGICAL ARGUMENT (p. 925) 1. The conclusion is invalid. This does not follow the chain rule. 3. The conclusion is valid. This is not an example of the *Or* rule. 5. The conclusion is valid. This is an example of the chain rule. 7. The conclusion is invalid. This is not an example of an indirect argument. 9. The conclusion is valid. This is an example of the AND rule. 11. true 13. true 17. true 19. true 21. true 23. true 25. true

IF-THEN STATEMENTS (p. 926) 1. If it rains in Spain, then it falls on the plain. 3. If $x = 4$, then $3x^2 = 48$. 5. If you finish cleaning, then you can go out tonight. 7. If $x = 3$, then $y = 16$. 9. If a rectangle has four equal sides, then it is a square. 11. If a curve is described by $y = x^2$, then it is a parabola. 13. If $x^2 = 16$, then $x = 4$; false. 15. If a line's slope is undefined, then it is a vertical line; true. 17. If a figure is a parallelogram, then it has two pairs of opposite congruent sides; true. 19. If you are cold, then you are in Minnesota in January; false. 21. If Margot got more votes than her opponent, then she won the election; true. 23. If a convex polygon is a regular pentagon, then it has five equal sides; true. 25. False; a square has four equal sides and four 90° angles. 27. False; $x^2 = 25$ for $x = 5, -5$. 29. true 31. true 33. true 35. true

COUNTEREXAMPLES (p. 928) 1. False; any parallelogram with angles that are not right angles is not a rectangle. 3. False; the last digit of the number 16 is 6, but 16 is not divisible by 3. 5. False; no triangle has two 90° angles because there must be a third angle and together the three must total 180° . 7. False; cats can also be black. 9. true 11. False; if $a = 1$, then $3a - 4 = -1 < 0$. 13. true 15. true

JUSTIFY REASONING (p. 929) 1. Division property of equality 3. Multiplication property of equality 5. Addition property of equality 7. Multiplication property of equality 9. Definition of raising to a power (2) 11. Subtraction property of equality

13. Multiplication property of equality 15. Addition property of equality 17. Multiplication property of equality 19. Distributive property

21. $9x = 27$ Given
 $x = 3$ Division property of equality

23. $\frac{x}{2} + 5 = 0$ Given
 $\frac{x}{2} = -5$ Subtraction property of equality
 $x = -10$ Multiplication property of equality

25. $\frac{5x}{2} - 2 = -5$ Given
 $5x - 4 = -10$ Multiplication property of equality
 $5x = -6$ Addition property of equality
 $x = -\frac{6}{5}$ Division property of equality

27. $\frac{3x}{4} = 6$ Given
 $3x = 24$ Multiplication property of equality
 $x = 8$ Division property of equality

TRANSLATING PHRASES INTO ALGEBRAIC

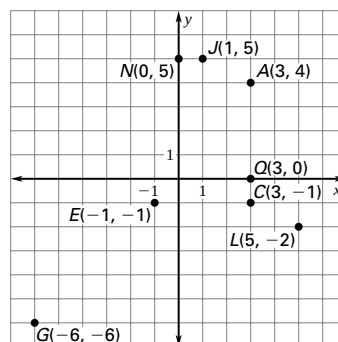
EXPRESSIONS (p. 930) 1. $x + 8$ 3. $x - 49$ 5. $7x$ 7. $\frac{3}{4}x$
9. $0.90x$ 11. $x - 4$ 13. $\frac{x+3}{2}$ 15. $3b$ 17. $67.39 - x$ 19. $2.5x$

ADDITIONAL PROBLEM SOLVING STRATEGIES (p. 932)

1. 10 3. from 40 to 60 people 5. 128 ft/sec 7. 3, 6, 9, 11, 12, 14, 17, 19, 22, 27 9. 10 11. 35 13. 204

POINTS IN THE COORDINATE PLANE (p. 933)

1–15 odd:



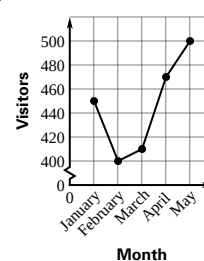
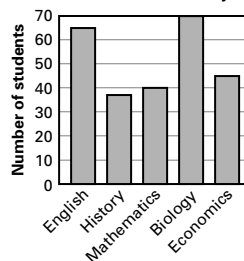
17. (0, 4), y-axis
19. (-5, 5), Quadrant II
21. (2, -5), Quadrant IV
23. (-5, -5), Quadrant III
25. (3, -3), Quadrant IV

27. (-3, 0), x-axis 29. (-5, 2), Quadrant II
31. (5, 5), Quadrant I 33. (-8, -4), Quadrant III
35. (7, -4), Quadrant IV 37. (4, -7), Quadrant IV

BAR, CIRCLE, AND LINE GRAPHS (p. 935)

1. about 1.2 ft 3. about 120 5. about 20%

7. **Students with Each Major** 9. **Visitors to the Zoo**



OPPOSITES (p. 936) 1. -3 3. -150 5. -4.3 7. $-\frac{3}{5}$
9. $-2a - b$ 11. $-a + b + c$ 13. $-2 - x$ 15. $1 - 4x$

17. $-x^2 - 2x + 4$ 19. $-2x - 3y$ 21. $-3x + y - 11z$
23. $36x - 54y$ 25. $x - 7y$ 27. $-a + 3b$

MULTIPLYING BINOMIALS (p. 937) 1. $x^2 + 2x + 1$ 3. $4x^2 + 9x + 2$ 5. $-2x^2 - 5x + 3$ 7. $4x^2 - 25$ 9. $5x^2 - 7x - 6$
11. $2y^2 + 3y - 9$ 13. $ac + ad + bc + bd$ 15. $-4x^2 + 1$
17. $x^2 - y^2$ 19. $3x^2 - x - 10$ 21. $-12x^2 + 4x + 96$

FACTORING (p. 938) 1. $(x + 3)(x + 2)$ 3. $(x + 4)(x + 5)$
5. $(x + 3)(x + 3)$ 7. $(x + 3)(x - 8)$ 9. $(x + 2)(x + 1)$
11. $(x + 3)(x - 2)$ 13. $(x + 7)(x + 7)$ 15. $(x - 10)(x + 2)$
17. $(x - 9)(x - 9)$ 19. $(x - 5)(x - 3)$ 21. $(x - 16)(x - 5)$
23. $(x - 4)(x + 1)$ 25. $(x - 5)(x - 4)$ 27. $(x + 5)(x + 5)$
29. $(x + 4)(x + 2)$

LEAST COMMON DENOMINATOR (p. 939)

1. $2x$ 3. $90k^2$ 5. $6xy$ 7. $3z^2$ 9. $(b - 1)(b + 1)^2$
11. $2(n + 2)$ 13. $6(2 + 3x)$ 15. $10(3h - 4)$ 17. $12 - 20e$
19. $c^2(c - 1)(c - 4)$ 21. $36x^2$ 23. $3x^2 + 2x$

EXTRA PRACTICE

CHAPTER 1 (p. 940)

1. ; 3.
 $-3, -2.8, \frac{4}{7}, \frac{9}{5}, \sqrt{8}$ $-1.6, 0, 0.4, \frac{3}{5}, \sqrt{3}$

5. ; $-\frac{2}{5}, 0.3, \sqrt{5}, \frac{5}{2}, 3.4$

7. commutative property of multiplication 9. inverse property of addition 11. commutative property of addition
13. 9 15. -36 17. 12 19. $12x^2 - 13x$ 21. $-9x^2 + 2x$
23. $5x + 4$ 25. 7 27. -9 29. -2.3 31. $y = \frac{-3x + 12}{4}$
33. $y = \frac{7x + 9}{6}$ 35. $y = \frac{2}{25}x + \frac{3}{10}$ 37. $C = \text{Total cost (dollars), 15 = Cost of first pound (dollars), 3 = Cost per pound of each additional pound (dollars per pound), 6 = Number of additional pounds (pounds)}$ 39. $C = 33$; it will cost \$33 to send a 7 pound package.

41. $x > 7$; 43. $x > 2$;

45. $2 \leq x \leq 10$; 47. $x < 3$ or $x \geq 8$;

49. $x \leq \frac{23}{3}$ or $x > 12$;

51. 28, -22 53. 10.2, 4.4 55. $\frac{62}{7}, -\frac{22}{7}$ 57. 2

59. $x < -7$ or $x > 1$; 61. $-3 < x < 1$;

63. $2 < y < 3$; 65. $x \leq -\frac{17}{3}$ or $x \geq 5$;

67. $y < -1$ or $y > 4$;

CHAPTER 2 (p. 941)

1. ; yes 3. ; yes 5. 5 7. -46
9. -36 11. parallel 13. perpendicular

15. parallel 17. 19.

21. 23. undefined; none 25. 2; -5
27. 2; 10 29. $\frac{1}{3}, \frac{8}{3}$

31. 33.

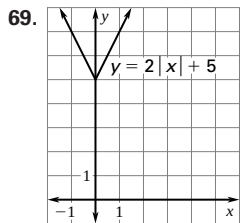
35. 37.

39. $y = 2$ 41. $y = 2x - 5$ 43. $y = -\frac{5}{2}x + \frac{7}{2}$
45. $y = -2x - 3$ 47. $y = 6$

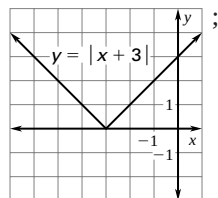
49. 51.

53. 55.

61. -4 63. 9 65. 2 67.

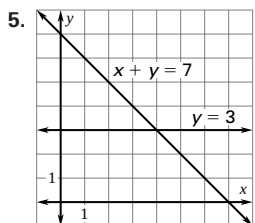


(0, 5); up; narrower

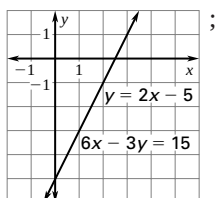


(-3, 0); up; same

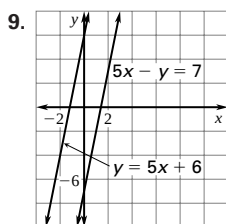
CHAPTER 3 (p. 943) 1. no 3. no 5–11. Estimates may vary.



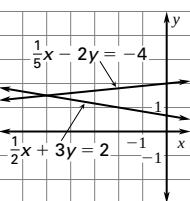
1; (4, 3)



infinitely many

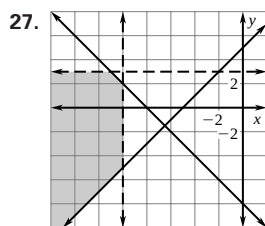
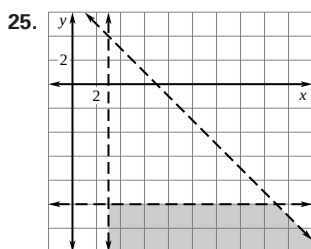
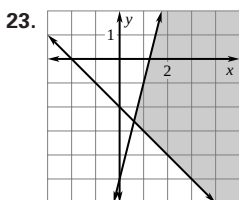
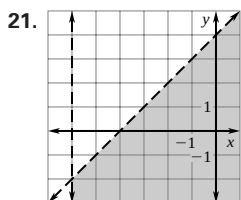


none

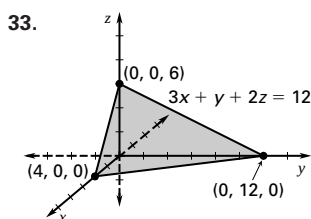


1; (-5, 1.5)

13. $(7, \frac{17}{2})$ 15. (-3, -2) 17. (2, 0) 19. (-8, -9)



29. -25; 48 31. -27; 25



39. $f(x, y) = -\frac{1}{3}x - \frac{1}{3}y + 3$; 3

41. $f(x, y) = -x + \frac{5}{2}y - 5$; 4

43. $f(x, y) = \frac{1}{7}x - \frac{4}{7}y - \frac{31}{7}$; -4

45. (0, -2, 5) 47. (-3, 4, 2)

49. $(\frac{1}{2}, 3, 7)$

CHAPTER 4 (p. 944)

1. $\begin{bmatrix} 4 & 2 \\ -4 & 4 \end{bmatrix}$ 3. $\begin{bmatrix} -1 & -1 & 7 \\ 1 & 0 & -4 \end{bmatrix}$ 5. $\begin{bmatrix} 3\frac{2}{3} & \frac{1}{5} \\ 5 & -\frac{1}{3} \end{bmatrix}$ 7. $\begin{bmatrix} 5 & -6 \\ 17 & 27 \end{bmatrix}$

9. $\begin{bmatrix} 2.6 & 3.8 & 4.9 \\ 2.3 & 3.4 & 4.2 \end{bmatrix}$ 11. [4.4] 13. $\begin{bmatrix} 10.83 & -23.2 \\ 66.62 & 23.31 \end{bmatrix}$

15. $\begin{bmatrix} -14 & 33 & 57 \\ -66 & -3 & -36 \\ -74 & 23 & -12 \end{bmatrix}$ 17. Machine 1 $\begin{bmatrix} \$40.05 \\ \$50.85 \\ \$44.45 \end{bmatrix}$ Machine 2 Machine 3 19. 29

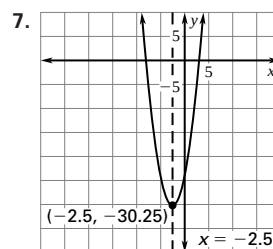
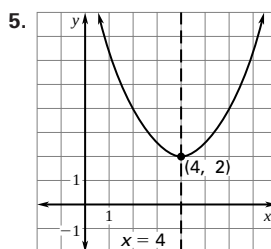
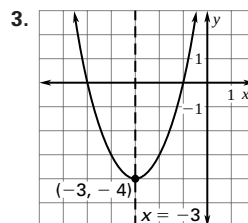
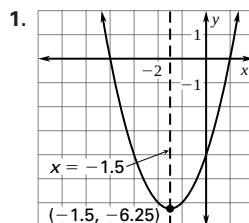
21. -51 23. 799 25. (2, -3) 27. (-6, -4) 29. (5, -1, -2)

31. $\begin{bmatrix} 2 & -1 \\ -7 & 4 \\ -3 & 3 \end{bmatrix}$ 33. $\begin{bmatrix} -\frac{1}{6} & \frac{1}{2} \\ \frac{1}{12} & \frac{1}{4} \end{bmatrix}$ 35. $\begin{bmatrix} \frac{1}{2} & \frac{1}{8} \\ \frac{1}{4} & -\frac{1}{16} \end{bmatrix}$ 37. $\begin{bmatrix} 3 & 7 \\ 4 & 9 \end{bmatrix}$

39. (5, 1) 41. (-1, -1) 43. (0, -2) 45. $(-\frac{7}{5}, 5)$

47. (3, -2, 1)

CHAPTER 5 (p. 945)



9. 0 mi/h 11. $(m - 4)(m - 5)$ 13. $(3x - 2)(2x + 3)$ 15. $(2u + 5)(2u - 7)$ 17. $(x - 5)^2$ 19. $2(2x - 5)(x + 2)$

21. cannot be factored 23. $-\frac{1}{2}, 7$ 25. $\frac{2}{5}$ 27. $-\frac{4}{3}, \frac{1}{2}$

29. $-\frac{8}{3}, \frac{5}{4}$ 31. $y = x(x - 5)$; 0, 5 33. $y = 6(x + 2)(x - 2)$; 2, -2

35. $y = (5x - 3)(x - 2)$; $\frac{3}{5}, 2$ 37. $y = 7(x + 3)(x - 3)$; 3, -3

39. $5\sqrt{5}$ 41. $9\sqrt{3}$ 43. $\frac{9\sqrt{5}}{25}$ 45. $\frac{4}{5}$ 47. $4\sqrt{10}, -4\sqrt{10}$

49. $\sqrt{5} - 2, -\sqrt{5} - 2$ 51. 5, -5 53. 7, 1 55. $i\sqrt{10}, -i\sqrt{10}$

57. $5i, -5i$ 59. $6i, -6i$ 61. $-1 + 2i\sqrt{5}, -1 - 2i\sqrt{5}$

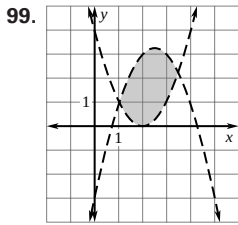
63. $-4 - 3i$ 65. 0 67. $-4 - 6i$ 69. $11 - 11i$ 71. $\frac{15}{26} - \frac{3}{26}i$

73. $-i$ 75. $2 + 2i, 2 - 2i$ 77. 0.866, -3.47 79. $-\frac{2}{3}, 2$

81. $\frac{4}{5}, -2$ 83. $\frac{3}{4}, -1$ 85. $-\frac{3}{2} + \frac{\sqrt{41}}{2}, -\frac{3}{2} - \frac{\sqrt{41}}{2}$

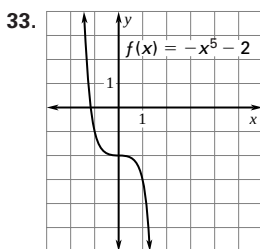
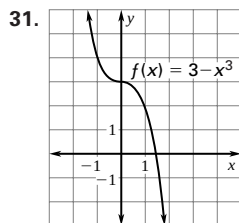
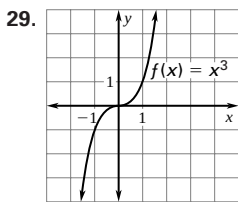
87. $\frac{3}{7} + \frac{\sqrt{61}}{7}i, \frac{3}{7} - \frac{\sqrt{61}}{7}i$ 89. 1; 2; real

91. -191; 2; imaginary 93. -40; 2; imaginary



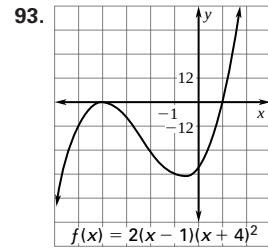
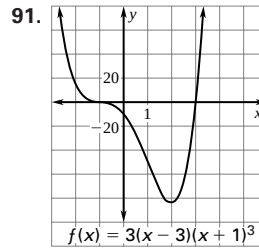
101. $y = (x-1)^2 + 1$
 103. $y = \frac{1}{9}(x-2)^2 + 1$
 105. $y = 2(x+3)^2 - 5$
 107. $y = (x-2)(x-6)$
 109. $y = 2x(x-4)$
 111. $y = \frac{3}{4}(x-1)(x-2)$
 113. $y = -\frac{1}{6}(x-5)(x+2)$

CHAPTER 6 (p. 947) 1. 625; product of powers 3. 512;
 power of a power 5. $\frac{16}{25}$; power of a quotient 7. $\frac{1}{512}$;
 Sample answer: zero exponent, negative exponent
 9. $\frac{1}{46,656}$; Sample answer: product of powers, power of a
 quotient 11. 6; zero exponent, quotient of powers
 13. 1,048,576 x^8 ; power of a product, power of a power
 15. x^3 ; quotient of powers 17. $\frac{1}{36x^6y^8}$; power of a
 product, power of a power, negative exponent
 19. $-\frac{1}{2187x^{63}y^{21}}$; power of a product, power of a power,
 negative exponent
 21. $\frac{1}{64x^{12}y^{16}}$; power of a product, power of a power,
 negative exponent 23. $\frac{3x^8}{y^5}$; product of powers, quotient
 of powers, negative exponent 25. 19 27. -4



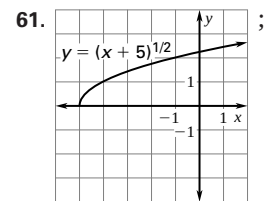
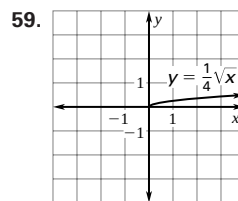
35. $5x^2 + 10x + 7$
 37. $5x^3 - 10x^2 + 18$
 39. $15x^3 + 9x^2 + 29x - 16$
 41. $x^2 + 2x - 35$
 43. $-3x^3 - 16x^2 + 17x + 30$
 45. $12x^4 - 24x^3 + 42x$
 47. $8x^3 + 96x^2 + 384x + 512$
 49. $x^3 + 3x^2y + 3xy^2 + y^3$

51. $2(x+5)(x^2-5x+25)$ 53. $(x+1)(x+3)^2$
 55. $3(x-2)(x^2+2x+4)$ 57. $(2x^2-5)(x+9)$ 59. $(\sqrt{3}+3)$
 inches by $(\sqrt{3}-1)$ inches by $\sqrt{3}$ inches 61. x^2-6x+3
 63. $3x^3-29x^2+129x-540+\frac{2176}{x+4}$
 65. $4x^3+3x^2+8x+15+\frac{35}{x-2}$
 67. -3, -2 69. 2 71. -5 73. 1, 2, 3 75. -2, 4 77. -1, 1,
 $\sqrt{5}, -\sqrt{5}$ 79. x^3+5x^2+8x+4 81. x^3-3x^2+x-3
 83. x^3-4x^2+6x-4 85. $x^4+x^3-6x^2-14x-12$
 87. $x^4-4x^3+41x^2-144x+180$
 89. $x^6+36x^4-625x^2-22,500$



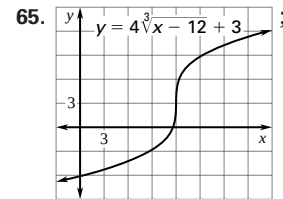
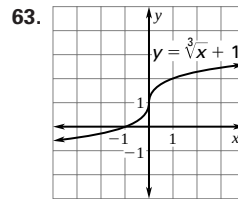
99. $y = \frac{1}{2x^2} + \frac{3}{2x}$ 101. $y = x^3 - 3x^2 + 2x + 3$

CHAPTER 7 (p. 949) 1. 3 3. $\frac{1}{4}$ 5. -125 7. $\frac{1}{9}$ 9. 2 11. 2
 13. 5 15. 2 17. $5^{1/2}$ 19. $7\sqrt[6]{7}$ 21. $x^{7/10}$ 23. $3xy^2\sqrt{x}$
 25. $\frac{\sqrt[6]{x^5}}{4x^5}$ 27. $\frac{2x^2y^4}{3}$ 29. $2x^2-4x-4$; all real numbers
 31. $2x^2-4x-4$; all real numbers 33. $2x^2-8x+10$;
 all real numbers 35. $2x^2-18$; all real numbers
 37. $3x^{5/6}$; nonnegative reals 39. $3x^{5/6}$; nonnegative reals
 41. $3x^{1/6}$; nonnegative reals 43. $3^{4/3}x^{1/9}$; nonnegative reals
 45. $f^{-1}(x) = \frac{x-1}{3}$ 47. $f^{-1}(x) = -x-4$ 49. $f^{-1}(x) = \frac{x-3}{2}$
 51. $f^{-1}(x) = 2x+8$ 53. $f^{-1}(x) = -3x+15$
 55. $f^{-1}(x) = \sqrt[4]{x} + \frac{1}{8}$ 57. $r = \frac{\sqrt{\pi A}}{\pi}$



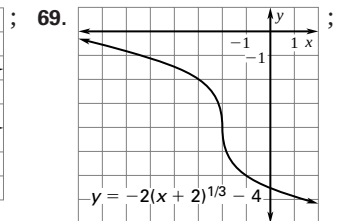
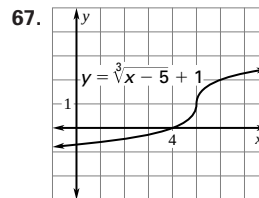
$x \geq 0; y \geq 0$

$x \geq -5; y \geq 0$



all reals; all reals

all reals; all reals

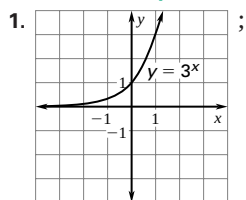


all reals; all reals

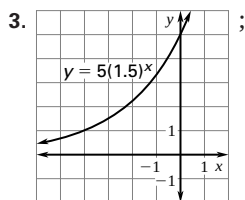
all reals; all reals

71. 43,046,721 73. no solution 75. -8 77. no solution
 79. 10 81. $\frac{101}{13}$ 83. 58.2; 57.5; 58; 21; 5.25
 85. 25.6; 21.3; 18.6; 46.7; 15.0

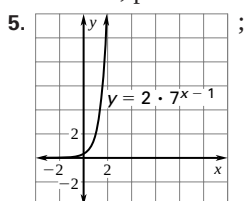
CHAPTER 8 (p. 950)



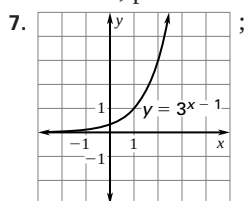
all reals; positive reals



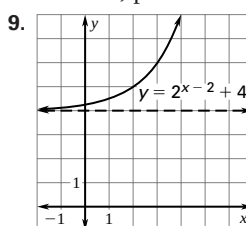
all reals; positive reals



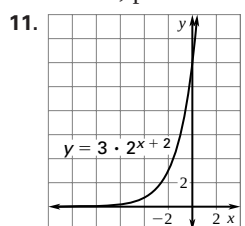
all reals; positive reals



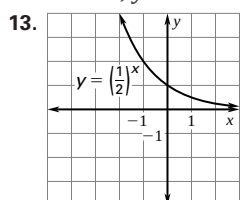
all reals; positive reals



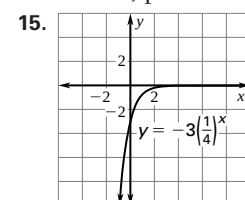
all reals; $y > 4$



all reals; positive reals

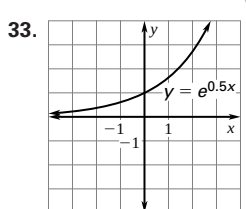


all reals; positive reals

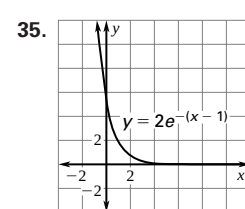


all reals; negative reals

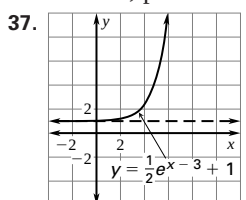
21. e^7 23. $16e^{6x}$ 25. $\frac{10}{e^{2x}}$ 27. e^{6x-1} 29. $4e^{4x-1}$ 31. $4e^{4x}$



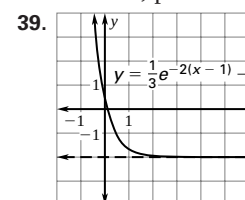
all reals; positive reals



all reals; positive reals



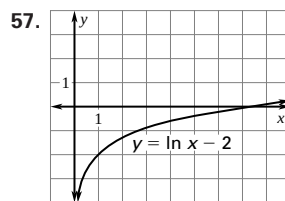
all reals; $y > 1$



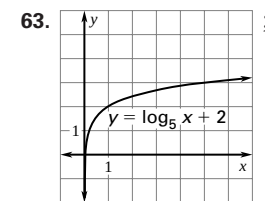
all reals; $y > -2$

41. about 8.96 lb per square inch 43. 2 45. $-\frac{1}{2}$ 47. 3

49. 3 51. $y = \left(\frac{1}{3}\right)^x$ 53. $y = \frac{1}{3}e^x$ 55. $y = e^x + 3$



positive reals; all reals



positive reals; all reals

65. 3 67. 3 69. -5 71. 6 73. $\log 3 + 4 \log x$

75. $\ln 15 + \ln x$ 77. $\log 3 + \frac{1}{2} \log x$

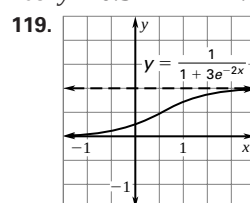
79. $2 \log x + 3 \log y + 4 \log z$ 81. $\ln x^4 y^6 z^3$ 83. $\ln \left(\frac{27}{x}\right)^{1/4}$

85. $\log_5 5^3 10^{-1}$ 87. 1.90 89. 0.778 91. -163,000 93. 5

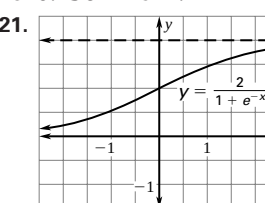
95. $y = 0.5(2)^x$ 97. $y = 0.25(5)^x$ 99. $y = 0.286(1.14)^x$

101. $y = -2(4)^x$ 103. $y = x^3$ 105. $y = 2x^{1/2}$ 107. $y = 3x^3$

109. $y = 0.5x^2$ 111. 2.43 113. 0.196 115. 1.2 117. 0.724



$y = 0, y = 1; \left(0, \frac{1}{4}\right);$
(0.549, 0.5)



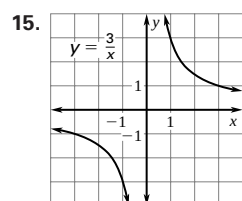
$y = 0, y = 2; (0, 1); (0, 1)$

CHAPTER 9 (p. 952)

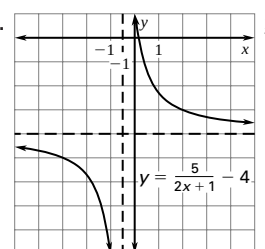
1. $y = \frac{18}{x}$; 4.5 3. $y = -\frac{4}{x}$; -1

5. $y = -\frac{3}{x}$; $-\frac{3}{4}$ 7. $y = \frac{1}{16x}$; $\frac{1}{64}$ 9. $z = xy$; 28

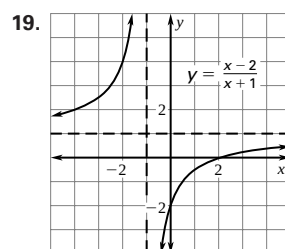
11. $z = -\frac{xy}{30}$; $-\frac{14}{15}$ 13. $z = \frac{64xy}{3}$; $\frac{1792}{3}$



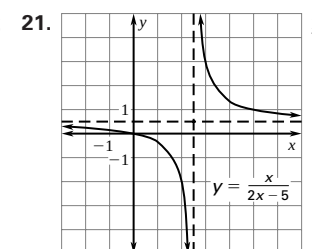
all reals except 0;
all reals except 0



all reals except $-\frac{1}{2}$;
all reals except -4

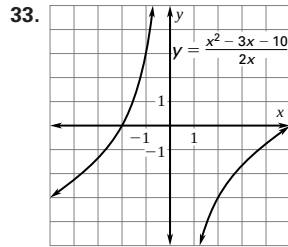
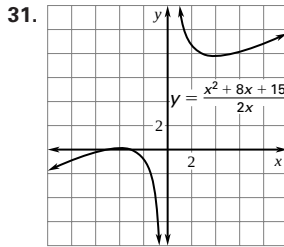
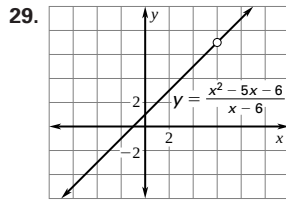
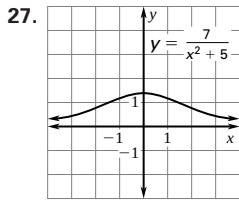


all reals except -1;
all reals except 1



all reals except $\frac{5}{2}$;
all reals except $\frac{1}{2}$

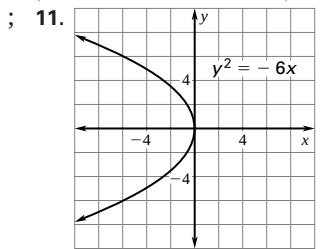
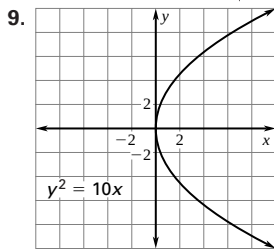
23. $C = \frac{4.50n + 710}{n}$ 25. The average cost decreases as the number of calendars printed increases.



35. $2x^4$ 37. $\frac{5x^4}{2x+4}$ 39. $\frac{x-3}{x+3}$ 41. $\frac{x(x^2-2x+4)(2x-3)}{x-2}$
 43. $\frac{12}{5x}$ 45. $\frac{26}{15x}$ 47. $\frac{7x+11}{(x+2)(x-2)}$ 49. $\frac{-3x-2}{(x+3)(x+5)}$
 51. $\frac{-4x+4}{2x+1}$ 53. $\frac{11}{2x^2}$ 55. $\frac{9x+13}{4x}$ 57. $\frac{24x}{(x+7)(5-18x)}$
 59. 2 61. $\frac{12}{29}$ 63. $-\frac{5}{3}$ 65. $\frac{1}{3}$ 67. $-\frac{3}{4}, 0$ 69. $\frac{7}{2}$

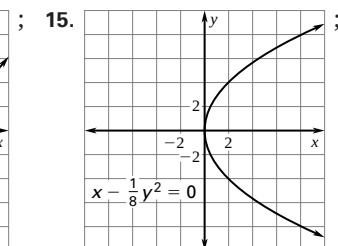
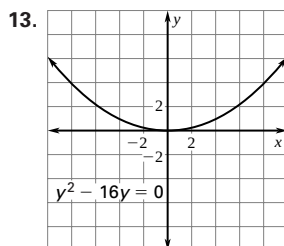
CHAPTER 10 (p. 953)

1. 10; (3, 4) 3. 5.83; $(-\frac{3}{2}, -\frac{7}{2})$ 5. 5; (3, 4) 7. 3.12; $(-4, \frac{7}{2})$



$(\frac{5}{2}, 0); x = -\frac{5}{2}$

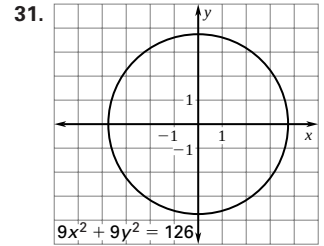
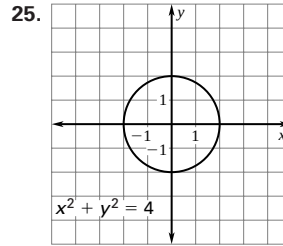
$(-\frac{3}{2}, 0); x = \frac{3}{2}$



(0, 4); $y = -4$

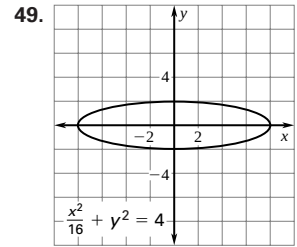
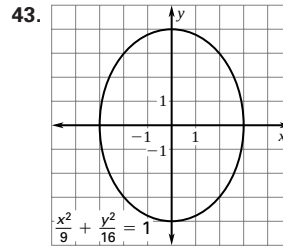
(2, 0); $y = -2$

17. $y^2 = 12x$ 19. $y^2 = 2x$ 21. $x^2 = -24y$ 23. $x^2 = -3y$



33. $x^2 + y^2 = 16$ 35. $x^2 + y^2 = 13$ 37. $x^2 + y^2 = 36$

39. $x^2 + y^2 = 29$ 41. $x^2 + y^2 \leq 100$

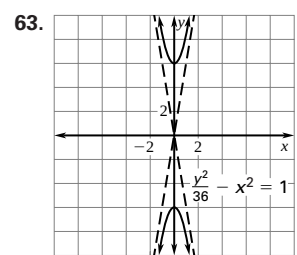
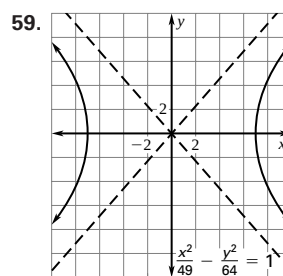


(0, 4), (0, -4);
 (-3, 0), (3, 0);
 (0, sqrt(7)), (0, -sqrt(7))

(-8, 0), (8, 0);
 (0, 2), (0, -2);
 (-2sqrt(15), 0), (2sqrt(15), 0)

51. $\frac{x^2}{16} + \frac{y^2}{64} = 1$ 53. $\frac{x^2}{49} + \frac{y^2}{4} = 1$

55. $\frac{x^2}{256} + \frac{y^2}{100} = 1$ 57. $\frac{x^2}{4} + \frac{y^2}{400} = 1$



$(-\sqrt{113}, 0), (\sqrt{113}, 0);$
 $y = \frac{8}{7}x, y = -\frac{8}{7}x$

$(0, \sqrt{37}), (0, -\sqrt{37});$
 $y = 6x, y = -6x$

67. $(x-3)^2 + (y-4)^2 = 25$ 69. $(x-2)^2 + (y+5)^2 = 49$

71. $\frac{(x-3)^2}{25} + \frac{(y-3)^2}{9} = 1$ 73. $\frac{(x-2)^2}{9} - \frac{(y-6)^2}{7} = 1$

75. parabola 77. hyperbola 79. (2, 4), (-4, -2) 81. none

83. (3, 0), (5, 4) 85. $(\frac{14}{5}, -\frac{2}{5}), (-2, 2)$

CHAPTER 11 (p. 955)

1. 14; $a_n = 3n - 1$ 3. -13;
 $a_n = -4n + 7$ 5. -256; $a_n = -(-4)^{n-1}$ 7. $\frac{1}{1024}; a_n = \frac{1}{4^n}$

9. 72 11. 55 13. 440 15. $\frac{169}{20}$ 17. $a_n = -2 + 3n; 28$

19. $a_n = 18 - 10n; -82$ 21. $a_n = \frac{11}{4} - \frac{1}{2}n; -\frac{9}{4}$

23. $a_n = 2 - 2n; -18$ 25. $a_n = -9 + 4n; 31$ 27. the 21st row

29. $a_n = -(\frac{1}{2})^{n-1}; -\frac{1}{128}$ 31. $a_n = (-\frac{1}{10})^{n-2}; \frac{1}{1,000,000}$

33. $a_n = -\frac{1}{2}(6)^n; -839,808$ 35. $a_n = 750(\frac{1}{5})^n; \frac{6}{3125}$

37. 61,035,156 39. -728 41. $\frac{60,466,175}{839,808}$ 43. $\frac{3}{2}$ 45. none
 47. none 49. $-\frac{1}{18}$ 51. $a_1 = 2, a_n = a_{n-1} + 4$
 53. $a_1 = 2, a_n = a_{n-1} + 5(3)^{n-2}$ 55. $a_1 = -6, a_2 = -9,$
 $a_n = a_{n-1} \cdot a_{n-2}$

CHAPTER 12 (p. 956) 1. 2 3. 12 5. 12 7. 6 9. 120

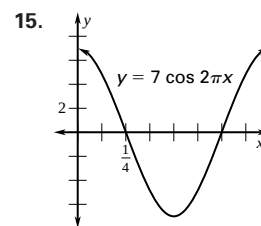
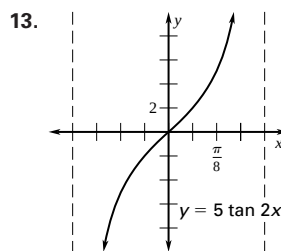
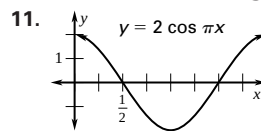
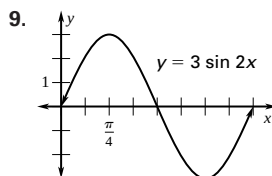
11. 50,400 13. 840 15. 15 17. 1 19. 1 21. 1140
 23. $x^7 + 7x^6y + 21x^5y^2 + 35x^4y^3 + 35x^3y^4 + 21x^2y^5 + 7xy^6 + y^7$ 25. $x^{12} + 12x^{10}y + 60x^8y^2 + 160x^6y^3 + 240x^4y^4 + 192x^2y^5 + 64y^6$ 27. $243x^{10} - 2025x^8 + 6750x^6 - 11,250x^4 + 9375x^2 - 3125$ 29. $x^9 + 3x^6y^3 + 3x^3y^6 + y^9$ 31. $\frac{1}{13}$ 33. $\frac{1}{2}$ 35. $\frac{3}{13}$ 37. $\frac{113}{200}$ 39. $\frac{87}{200}$
 41. $\frac{127}{200}$ 43. $\frac{1}{8}$ 45. $\frac{1}{2}$ 47. $\frac{3}{8}$ 49. 0.5; no 51. 43%; yes
 53. 4%; no 55. 1 57. $\frac{1}{4}$ 59. 0.8 61. $\frac{1}{16}$ 63. $\frac{8}{75}$ 65. $\frac{4}{45}$
 67. $\frac{8}{75}$ 69. $\frac{2}{15}$ 71. 0.0543 73. 0.117 75. 0.00217
 77. 0.00305 79. 0.4985 81. 0.84 83. 0.9985 85. 0.5

CHAPTER 13 (p. 957) 1. $\sin \theta = \frac{\sqrt{2}}{2}; \cos \theta = \frac{\sqrt{2}}{2}, \tan \theta = 1;$

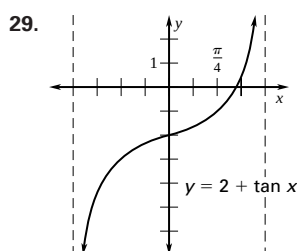
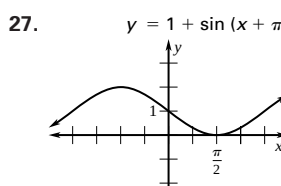
- $\sec \theta = \sqrt{2}; \csc \theta = \sqrt{2}; \cot \theta = 1$ 3. $\sin \theta = \frac{2\sqrt{14}}{9};$
 $\cos \theta = \frac{5}{9}; \tan \theta = \frac{2\sqrt{14}}{5}; \sec \theta = \frac{9}{5}; \csc \theta = \frac{9\sqrt{14}}{28};$
 $\cot \theta = \frac{5\sqrt{14}}{28}$ 5-15. Sample answers are given.
 5. $395^\circ; -325^\circ$ 7. $485^\circ; -235^\circ$ 9. $315^\circ; -405^\circ$
 11. $225^\circ; -135^\circ$ 13. $\frac{8\pi}{3}; -\frac{4\pi}{3}$ 15. $\frac{6\pi}{5}; -\frac{4\pi}{5}$
 17. $\frac{4\pi}{3}$ in.; $\frac{8\pi}{3}$ in.² 19. $\frac{21\pi}{2}$ cm; $\frac{147\pi}{2}$ cm²
 21. $\frac{9\pi}{5}$ cm; $\frac{9\pi}{10}$ cm² 23. $\sin \theta = \frac{5\sqrt{41}}{41}; \cos \theta = \frac{4\sqrt{41}}{41};$
 $\tan \theta = \frac{5}{4}; \sec \theta = \frac{\sqrt{41}}{4}; \csc \theta = \frac{\sqrt{41}}{5}; \cot \theta = \frac{4}{5}$
 25. $\sin \theta = -\frac{3\sqrt{10}}{10}; \cos \theta = -\frac{\sqrt{10}}{10}; \tan \theta = 3;$
 $\sec \theta = -\sqrt{10}; \csc \theta = -\frac{\sqrt{10}}{3}; \cot \theta = \frac{1}{3}$
 27. $\sin \theta = \frac{\sqrt{5}}{5}; \cos \theta = \frac{2\sqrt{5}}{5}; \tan \theta = \frac{1}{2}; \sec \theta = \frac{\sqrt{5}}{2};$
 $\csc \theta = \sqrt{5}; \cot \theta = 2$ 29. $\sin \theta = -\frac{2\sqrt{67}}{67}; \cos \theta = \frac{3\sqrt{469}}{67};$
 $\tan \theta = -\frac{2\sqrt{7}}{21}; \sec \theta = \frac{\sqrt{469}}{21}; \csc \theta = -\frac{\sqrt{67}}{2};$
 $\cot \theta = -\frac{3\sqrt{7}}{2}$ 31. $\sin \theta = -\frac{5\sqrt{34}}{34}; \cos \theta = \frac{3\sqrt{34}}{34};$
 $\tan \theta = -\frac{5}{3}; \sec \theta = \frac{\sqrt{34}}{3}; \csc \theta = -\frac{\sqrt{34}}{5}; \cot \theta = -\frac{3}{5}$
 33. $\sin \theta = \frac{2\sqrt{5}}{5}; \cos \theta = -\frac{\sqrt{5}}{5}; \tan \theta = -2; \sec \theta = -\sqrt{5};$
 $\csc \theta = \frac{\sqrt{5}}{2}; \cot \theta = -\frac{1}{2}$ 35. $-\frac{1}{2}$ 37. $\frac{\sqrt{2}}{2}$ 39. $\frac{\sqrt{2}}{2}$
 41. $-\frac{\sqrt{3}}{2}$ 43. $-45^\circ; -\frac{\pi}{4}$ 45. $-30^\circ; -\frac{\pi}{6}$ 47. $30^\circ; \frac{\pi}{6}$
 49. $60^\circ; \frac{\pi}{3}$ 51. $41.8^\circ; 30^\circ$ 53. $B \approx 93^\circ; b \approx 7.61; c \approx 5.48$
 55. $B \approx 65^\circ; a \approx 6; c \approx 5.07$ 57. about 34.4 59. about 4140

61. about 1720 63. about 63.6 65. about 283
 67. $y = \frac{x-7}{2}; -7 \leq x \leq 5369$ 69. $y = x; 0 \leq x \leq 500$

CHAPTER 14 (p. 959) 1. 6; 4π 3. $\frac{1}{7}; 2$ 5. 1, 1 7. $\frac{2}{5}; 8\pi$



17. Shift the graph of $y = \cos x$ up 3 units. 19. Shift the graph of $y = \cos x$ up 4 units and reflect the graph in the line $y = 4$. 21. Shift the graph of $y = \cos x$ right π units.
 23. Shift the graph of $y = \cos x$ right $\frac{\pi}{2}$ units.



33. $\sec x$ 35. $\sin^2 x$ 37. $\cos x$ 39. $\frac{2}{\sin x}$ 41. $-\cos x \sin x$
 43. $\frac{7\pi}{6} + 2n\pi, \frac{11\pi}{6} + 2n\pi$ 45. $\frac{\pi}{3} + 2n\pi, \frac{2\pi}{3} + 2n\pi, \frac{4\pi}{3} + 2n\pi, \frac{5\pi}{3} + 2n\pi$ 47. $2n\pi, \frac{2\pi}{3} + 2n\pi, \pi + 2n\pi, \frac{4\pi}{3} + 2n\pi$
 49. $\frac{\pi}{4} + 2n\pi, \frac{7\pi}{4} + 2n\pi, \frac{3\pi}{4} + 2n\pi, \frac{5\pi}{4} + 2n\pi$
 51. 0.615, 3.76 53. $\frac{3\pi}{2}$ 55. $\frac{\pi}{3}, \frac{5\pi}{3}$ 57. 0, 0.464, π , 3.61
 59. 0, π 61-65. Sample answers are given.
 61. $y = \frac{1}{2} \cos \left(\frac{1}{2} \left(x + \pi \right) \right) + \frac{3}{2}$ 63. $y = 4 \cos \left(3 \left(x + \frac{\pi}{3} \right) \right) - 4$
 65. $y = \cos (\pi(x-1)) + 22$ 67. $-\frac{\sqrt{2}}{2}$ 69. $\frac{-\sqrt{6}-\sqrt{2}}{4}$
 71. $-2 + \sqrt{3}$ 73. $\frac{\sqrt{3}}{3}$ 75. $\frac{11}{21}$ 77. $\frac{11\sqrt{5}}{40}$ 79. $\frac{4\sqrt{5}}{21}$
 81. $\frac{19}{21}$ 83. $-2 - \sqrt{3}$ 85. $-\frac{\sqrt{2}-\sqrt{2}}{2}$ 87. $\frac{\sqrt{2}-\sqrt{2}}{2}$
 89. $-2 - \sqrt{3}$ 91. $\frac{\sqrt{2}+\sqrt{2}}{2}$ 93. $-\frac{\sqrt{2}-\sqrt{3}}{2}$
 95. $\sin 2x = \frac{9\sqrt{19}}{50}; \cos 2x = \frac{31}{50}; \tan 2x = \frac{9\sqrt{19}}{31}$
 97. $\sin 2x = \frac{24}{25}; \cos 2x = \frac{7}{25}; \tan 2x = \frac{24}{7}$