Chapter 1 Review Exercises

In Exercises 1–14, write an equation for the specified line.

1. through $(1, -6)$ with slope 3
2. through $(-1, 2)$ with slope $-1/2$
3. the vertical line through $(0, -3)$
4. through $(-3, 6)$ and $(1, -2)$
5. the horizontal line through $(0, 2)$
6. through $(3, 3)$ and $(-2, 5)$
7. with slope -3 and y-intercept 3
8. through $(3, 1)$ and parallel to $2x - y = -2$
9. through $(4, -12)$ and parallel to $4x + 3y = 12$
10. through $(-2, -3)$ and perpendicular to $3x - 5y = 1$
11. through $(-1, 2)$ and perpendicular to $\frac{1}{2}x + \frac{1}{3}y = 1$
12. with x-intercept 3 and y-intercept -5
13. the line $y = f(x)$, where f has the following values:

x	-2	2	4
$f(x)$	4	2	1

14. through $(4, -2)$ with x-intercept -3

In Exercises 15–18, determine whether the graph of the function is symmetric about the y-axis, the origin, or neither.

15. $y = x^{1/5}$
16. $y = x^{2/5}$
17. $y = x^2 - 2x - 1$
18. $y = e^{-x^2}$

In Exercises 19–26, determine whether the function is even, odd, or neither.

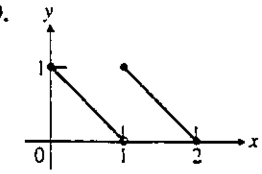
19. $y = x^2 + 1$
20. $y = x^5 - x^3 - x$
21. $y = 1 - \cos x$
22. $y = \sec x \tan x$
23. $y = \dfrac{x^4 + 1}{x^3 - 2x}$
24. $y = 1 - \sin x$
25. $y = x + \cos x$
26. $y = \sqrt{x^4 - 1}$

In Exercises 27–38, find the (a) domain and (b) range, and (c) graph the function.

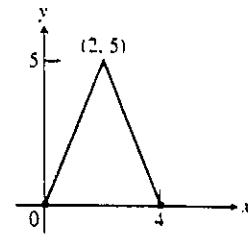
27. $y = |x| - 2$
28. $y = -2 + \sqrt{1 - x}$
29. $y = \sqrt{16 - x^2}$
30. $y = 3^{2-x} + 1$
31. $y = 2e^{-x} - 3$
32. $y = \tan(2x - \pi)$
33. $y = 2\sin(3x + \pi) - 1$
34. $y = x^{2/5}$
35. $y = \ln(x - 3) + 1$
36. $y = -1 + \sqrt[3]{2 - x}$
37. $y = \begin{cases} \sqrt{-x}, & -4 \le x \le 0 \\ \sqrt{x}, & 0 < x \le 4 \end{cases}$
38. $y = \begin{cases} -x - 2, & -2 \le x \le -1 \\ x, & -1 < x \le 1 \\ -x + 2, & 1 < x \le 2 \end{cases}$

In Exercises 39 and 40, write a piecewise formula for the function.

39.



40.



In Exercises 41 and 42, find

(a) $(f \circ g)(-1)$ (b) $(g \circ f)(2)$
(c) $(f \circ f)(x)$ (d) $(g \circ g)(x)$

41. $f(x) = \dfrac{1}{x}$, $g(x) = \dfrac{1}{\sqrt{x + 2}}$
42. $f(x) = 2 - x$, $g(x) = \sqrt[3]{x + 1}$

In Exercises 43 and 44, (a) write a formula for $f \circ g$ and $g \circ f$ and find the (b) domain and (c) range of each.

43. $f(x) = 2 - x^2$, $g(x) = \sqrt{x + 2}$
44. $f(x) = \sqrt{x}$, $g(x) = \sqrt{1 - x}$

In Exercises 45–48, a parametrization is given for a curve.

(a) Graph the curve. Identify the initial and terminal points, if any. Indicate the direction in which the curve is traced.

(b) Find a Cartesian equation for a curve that contains the parametrized curve. What portion of the graph of the Cartesian equation is traced by the parametrized curve?

45. $x = 5\cos t$, $y = 2\sin t$, $0 \le t \le 2\pi$
46. $x = 4\cos t$, $y = 4\sin t$, $\pi/2 \le t < 3\pi/2$
47. $x = 2 - t$, $y = 11 - 2t$, $-2 \le t \le 4$
48. $x = 1 + t$, $y = \sqrt{4 - 2t}$, $t \le 2$

In Exercises 49–52, give a parametrization for the curve.

49. the line segment with endpoints $(-2, 5)$ and $(4, 3)$
50. the line through $(-3, -2)$ and $(4, -1)$
51. the ray with initial point $(2, 5)$ that passes through $(-1, 0)$
52. $y = x(x - 4)$, $x \le 2$

In Exercises 53 and 54,
(a) find f^{-1} and show that $(f \circ f^{-1})(x) = (f^{-1} \circ f)(x) = x$.
(b) graph f and f^{-1} in the same viewing window.

53. $f(x) = 2 - 3x$
54. $f(x) = (x + 2)^2$, $x \ge -2$

In Exercises 55 and 56, find the measure of the angle in radians and degrees.

55. $\sin^{-1}(0.6)$ **56.** $\tan^{-1}(-2.3)$

57. Find the six trigonometric values of $\theta = \cos^{-1}(3/7)$. Give exact answers.

58. Solve the equation $\sin x = -0.2$ in the following intervals.

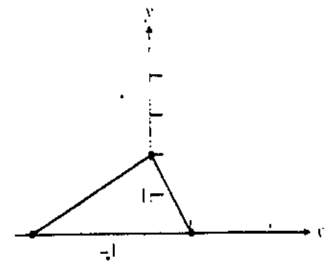
(a) $0 \le x < 2\pi$ **(b)** $-\infty < x < \infty$

59. Solve for x: $e^{-0.2x} = 4$

60. The graph of f is shown. Draw the graph of each function.

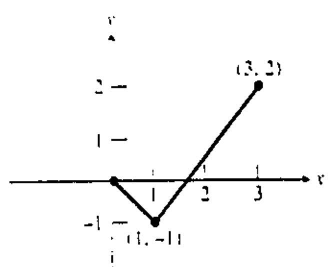
(a) $y = f(-x)$ **(b)** $y = -f(x)$

(c) $y = -2f(x - 1) - 1$ **(d)** $y = 3f(x - 2) - 2$



61. A portion of the graph of a function defined on $[-3, 3]$ is shown. Complete the graph assuming that the function is

(a) even. **(b)** odd.



62. *Depreciation* Smith Hauling purchased an 18-wheel truck for \$100,000. The truck depreciates at the constant rate of \$10,000 per year for 10 years.

(a) Write an expression that gives the value y after x years.

(b) When is the value of the truck \$55,000?

63. *Drug Absorption* A drug is administered intravenously for pain. The function

$$f(t) = 90 - 52\ln(1 + t), \quad 0 \le t \le 4$$

gives the number of units of the drug in the body after t hours.

(a) What was the initial number of units of the drug administered?

(b) How much is present after 2 hours?

(c) Draw the graph of f.

64. *Finding Time* If Joenita invests \$1500 in a retirement account that earns 8% compounded annually, how long will it take this single payment to grow to \$5000?

65. *Guppy Population* The number of guppies in Susan's aquarium doubles every day. There are four guppies initially.

(a) Write the number of guppies as a function of time t.

(b) How many guppies were present after 4 days? after 1 week?

(c) When will there be 2000 guppies?

(d) Writing to Learn Give reasons why this might not be a good model for the growth of Susan's guppy population.

66. *Doctoral Degrees* Table 1.22 shows the number of doctoral degrees earned in the given academic year by Hispanic students. Let $x = 0$ represent 1970–71, $x = 1$ represent 1971–72, and so forth.

Table 1.22 Doctorates Earned by Hispanic Americans

Year	Number of Degrees
1976–77	520
1980–81	460
1984–85	680
1988–89	630
1990–91	730
1991–92	810
1992–93	830

Source: U.S. Department of Education, as reported in the *Chronicle of Higher Education*, April 28, 1995.

(a) Find the linear regression equation for the data and superimpose its graph on a scatter plot of the data.

(b) Use the regression equation to predict the number of doctoral degrees that will be earned by Hispanic Americans in the academic year 2000–01.

(c) Writing to Learn Find the slope of the regression line. What does the slope represent?

67. *Estimating Population Growth* Use the data in Table 1.23 about the population of New York State. Let $x = 60$ represent 1960, $x = 70$ represent 1970, and so forth.

Table 1.23 Population of New York State

Year	Population (millions)
1960	16.78
1980	17.56
1990	17.99

Source: The Statesman's Yearbook, 129th ed. (London: The Macmillan Press, Ltd., 1992).

(a) Find the exponential regression equation for the data.

(b) Use the regression equation to predict when the population will be 25 million.

(c) What annual rate of growth can we infer from the regression equation?

SAMPLE TEST PROBLEMS

1. Calculate each value for $n = 1, 2$, and -2.

(a) $\left(n + \frac{1}{n}\right)^n$ (b) $(n^2 - n + 1)^2$

(c) $4^{3/n}$

2. Simplify.

(a) $\left(1 + \frac{1}{m} + \frac{1}{n}\right)\left(1 - \frac{1}{m} + \frac{1}{n}\right)^{-1}$

(b) $\dfrac{\dfrac{2}{x-1} - \dfrac{x}{x^2 - x - 2}}{\dfrac{3}{x+1} - \dfrac{2}{x-2}}$

3. Show that the average of two rational numbers is a rational number.

4. Write the repeating decimal $4.1282828\ldots$ as a ratio of two integers.

5. Find an irrational number between $\frac{1}{2}$ and $\frac{13}{25}$.

C **6.** Calculate $(\sqrt[3]{8.15 \times 10^4} - 1.32)^2/3.24$.

In Problems 7–14, find the solution set, graph this set on the real line, and express this set in interval notation.

7. $6x + 3 > 2x - 5$

8. $3 - 2x \le 4x + 1 \le 2x + 7$

9. $2x^2 + 5x - 3 < 0$

10. $\dfrac{2x - 1}{x - 2} > 0$

11. $(x + 4)(2x - 1)^2(x - 3) \le 0$

12. $|3x - 4| < 6$

13. $\dfrac{3}{1 - x} \le 2$

14. $|8 - 3x| \ge |2x|$

15. Suppose $|x| \le 2$. Use properties of absolute values to show

$$\left|\frac{2x^2 + 3x + 2}{x^2 + 2}\right| \le 8$$

16. Sketch the triangle with vertices $A(-2, 6)$, $B(1, 2)$, and $C(5, 5)$, and show that it is a right triangle.

17. Find the distance from $(3, -6)$ to the midpoint of the line segment from $A(1, 2)$ to $B(7, 8)$.

18. Find the equation of the circle with diameter AB if $A = (2, 0)$ and $B = (10, 4)$.

19. Find the center and radius of the circle with equation $x^2 + y^2 - 8x - 6y = 0$.

20. Find the distance between the centers of the circles with equations

$x^2 - 2x + y^2 + 2y = 2$ and $x^2 + 6x + y^2 - 4y = -7$

21. Write the equation of the line through $(-2, 1)$ which:

(a) goes through $(7, 3)$;
(b) is parallel to $3x - 2y = 5$;
(c) is perpendicular to $3x - 4y = 9$;
(d) is perpendicular to $y = 4$;
(e) has y-intercept 3.

22. Show that $(2, -1)$, $(5, 3)$, and $(11, 11)$ are on the same line.

In Problems 23–26, sketch the graph of each equation.

23. $3y - 4x = 6$

24. $x^2 - 2x + y^2 = 3$

25. $y = \dfrac{2x}{x^2 + 2}$

26. $x = y^2 - 3$

27. Find the points of intersection of the graphs of $y = x^2 - 2x + 4$ and $y - x = 4$.

28. Among all lines perpendicular to $4x - y = 2$, find the equation of the one which—together with the positive x- and y-axes—forms a triangle of area 8.

1. Convert the following to radians (leave π in your answer).

(a) 240° (b) -60° (c) -135
(d) 540 (e) 600 (f) 720
(g) 18 (h) 22.5 (i) 6

2. Convert the following radian measures to degrees.

(a) $\frac{7\pi}{6}$ (b) $\frac{-\pi}{3}$ (c) 8π
(d) $\frac{5\pi}{4}$ (e) $\frac{3\pi}{2}$ (f) $\frac{-11\pi}{12}$
(g) $\frac{\pi}{18}$ (h) $\frac{7\pi}{4}$ (i) $\frac{-\pi}{5}$

C **3.** Convert the following to radians ($1^\circ = \pi/180$ radians).

(a) 33.3 (b) 471.5 (c) -391.4
(d) 14.9 (e) 4.02 (f) -1.52

C **4.** Convert the following radian measures to degrees (1 radian $= 180/\pi$ degrees).

(a) 1.51 (b) -3.1416 (c) 2.31
(d) 34.25 (e) -0.002 (f) 6.28

C **5.** Calculate (be sure your calculator is in radian mode).

(a) $\sin(0.452)$ (b) $\cos(0.452)$
(c) $\tan(0.452)$ (d) $\sin(-0.361)$
(e) $\cos(-0.361)$ (f) $\tan(-0.361)$

6. FIND each value.

(a) $\sin(1.23)$ (b) $\cos(0.63)$
(c) $\tan(1.55)$ (d) $\sin(-1.23)$
(e) $\cos(-0.63)$ (f) $\tan(-1.55)$

C **7.** Calculate.

(a) $\frac{234.1\sin(1.56)}{\cos(0.34)}$ (b) $\sin^2(2.51) + \sqrt{\cos(0.51)}$

C **8.** Calculate.

(a) $\frac{56.3\tan 34.2}{\sin 56.1}$ (b) $\left(\frac{\sin 35}{\sin 26 + \cos 26}\right)^3$

9. Evaluate without use of a calculator.

(a) $\tan\left(\frac{\pi}{6}\right)$ (b) $\sec(\pi)$ (c) $\sec\left(\frac{3\pi}{4}\right)$
(d) $\csc\left(\frac{\pi}{2}\right)$ (e) $\cot\left(\frac{\pi}{4}\right)$ (f) $\tan\left(-\frac{\pi}{4}\right)$

10. Evaluate without use of a calculator.

(a) $\tan\left(\frac{\pi}{3}\right)$ (b) $\sec\left(\frac{\pi}{3}\right)$ (c) $\cot\left(\frac{\pi}{3}\right)$
(d) $\csc\left(\frac{\pi}{4}\right)$ (e) $\tan\left(-\frac{\pi}{6}\right)$ (f) $\cos\left(-\frac{\pi}{3}\right)$

11. Verify that the following are identities (see Example 2).

(a) $(1 + \sin z)(1 - \sin z) = \frac{1}{\sec^2 z}$
(b) $(\sec t - 1)(\sec t + 1) = \tan^2 t$
(c) $\sec t - \sin t \tan t = \cos t$
(d) $\frac{\sec^2 t - 1}{\sec^2 t} = \sin^2 t$
(e) $\cos t(\tan t + \cot t) = \csc t$

12. Verify that the following are identities.

(a) $\frac{\sin u}{\csc u} + \frac{\cos u}{\sec u} = 1$
(b) $(1 - \cos^2 x)(1 + \cot^2 x) = 1$
(c) $\sin t(\csc t - \sin t) = \cos^2 t$
(d) $\frac{1 - \csc^2 t}{\csc^2 t} = \frac{-1}{\sec^2 t}$
(e) $\frac{1}{\sin t\cos t} - \frac{\cos t}{\sin t} = \tan t$

13. Sketch the graphs of the following on $[-\pi, 2\pi]$.

(a) $y = \sec t$ (b) $y = 3\sin t$
(c) $y = \sin 2t$ (d) $y = \sin\left(t - \frac{\pi}{4}\right)$

14. Sketch the graphs of the following on $[-\pi, 2\pi]$.

(a) $y = \csc t$ (b) $y = 2\cos t$
(c) $y = \cos 3t$ (d) $y = \cos\left(t + \frac{\pi}{3}\right)$

15. Find the quadrant in which the point $P(x, y)$ will lie for each t below, and thereby determine the sign of $\cos t$. *Hint*: See the unit circle definition of $\cos t$.

(a) $t = 5.97$ (b) $t = 9.34$ (c) $t = -16.1$

16. Follow the directions of Problem 15 to determine the sign of $\tan t$.

(a) $t = 4.34$ (b) $t = -15$ (c) $t = 21.9$

17. Which of the following are odd functions? Even functions? Neither?

(a) $\sec t$ (b) $\csc t$
(c) $t\sin t$ (d) $x\cos x$
(e) $\sin^2 x$ (f) $\sin x + \cos x$

1) approximate a solution of

$$x^3 + 9x - 3 = 0$$

to within two decimal places.

2) approximate the solutions of

$$x^5 - 7x^4 - 2x^3 + 3x^2 + 7x - 4 = 0$$

to within two decimal places.

3) approximate solutions of

$$\frac{x^3}{x^2+7} = \frac{2x+3}{x^2+1}$$

4) approximate solutions of

$$(x - 5)^4 = (2x + 5)^3 - (3x - 1)^2$$

5) approximate solutions of the system

$$y = x^3 + 5x - 7$$
$$y = x^2 - 5$$

6) Approximate any zeros of $y = \sin(2x) + \cos(x+2)$ for $0 \le x \le 2\pi$

7) Determine approximate solutions of the equation

$$x^2\sin(3x) = (2x+3)\cos(2x+1) \quad \text{for } -1 \le x \le 1$$

8) Determine any approximate solutions of the equation

$$[\sin(x^2 - 2)]^2 - \cos(3x+1) = x^2$$

9) Use graphs to decide whether or not

$$\sin^2 x = \frac{1}{2}[1 - \cos(2x)]$$

is an identity.

10) Use graphs to decide whether or not

$$\sin(3x) = 3\sin x$$

is an identity.

11) Draw the graph of

$$y = \frac{x^2}{x^3 + 1}$$

Are there any asymptotes apparent from the graph? **What are they?**

12) Draw the graph of

$$y = \frac{x^2 - 4}{x^2 - 9}$$

with the Standard RANGE setting. Determine any horizontal or vertical asymptotes.

13) Draw the graph of

$$y = \frac{x^2 - 4}{x - 1}$$

Determine any horizontal or vertical asymptotes.

14) Draw the graph of

$$y = \frac{x - 3}{x^2 - 1}$$

Determine any asymptotes.

inequalities.

1. $|x - 2| \leq 3$
2. $|3x - 2| \leq 0$
3. $4 < (x + 3)^2$
4. $\frac{1}{|x|} < 1$

In Exercises 5 and 6, find the midpoint of the given interval.

5. $\left[\frac{7}{8}, \frac{10}{4}\right]$
6. $\left[-1, \frac{3}{2}\right]$

In Exercises 7 and 8, find the points of trisection for the given interval.

7. $[-2, 6]$
8. $[1, 5]$

vertices are $(1, 4)$, $(-3, 2)$, and $(5, 0)$.

10. Find the vertices of the triangle whose sides have midpoints $(0, 2)$, $(1, -1)$, and $(2, 1)$.

In Exercises 11–14, determine the radius and center of the given circle and sketch its graph.

11. $x^2 + y^2 + 6x - 2y + 1 = 0$
12. $4x^2 + 4y^2 - 4x + 8y = 11$
13. $x^2 + y^2 + 6x - 2y + 10 = 0$
14. $x^2 - 6x + y^2 + 8y = 0$

15. Determine the value of c so that the given circle has a radius of 2:
$$x^2 - 6x + y^2 + 8y = c$$

16. Find an equation in x and y such that the distance between (x, y) and $(-2, 0)$ is twice the distance between (x, y) and $(3, 1)$.
17. Find an equation for the circle whose center is $(1, 2)$ and whose radius is 3. Then determine if the following points are inside, outside, or on the circle.
(a) $(1, 5)$ (b) $(0, 0)$
(c) $(-2, 1)$ (d) $(0, 4)$
18. Find an equation for the circle whose center is $(2, 1)$ and whose radius is 2. Then determine if the following points are inside, outside, or on the circle.
(a) $(1, 1)$ (b) $(4, 2)$
(c) $(0, 1)$ (d) $(3, 1)$

In Exercises 19–22, sketch the graph of the given equation.

19. $y = \frac{-x + 3}{2}$
20. $y = 1 + \frac{1}{x}$
21. $y = 7 - 6x - x^2$
22. $y = 6x - x^2$

In Exercises 23 and 24, determine if the given points lie on the same straight line.

23. $(-1, 3)$, $(2, 9)$, $(3, 1)$
24. $(2, 5)$, $(4, 10)$, $(6, 20)$

In Exercises 25–28, use the slope and y-intercept to sketch the graph of the given line.

25. $4x - 2y = 6$
26. $0.02x + 0.15y = 0.25$
27. $-\frac{1}{3}x + \frac{5}{6}y = 1$
28. $51x + 17y = 102$

29. Find equations of the lines passing through $(-2, 4)$ and having the following characteristics:
(a) Slope of $\frac{7}{16}$
(b) Parallel to the line $5x - 3y = 3$
(c) Passing through the origin
(d) Parallel to the y-axis
30. Find equations of the lines passing through $(1, 3)$ and having the following characteristics:
(a) Slope of $-\frac{2}{3}$
(b) Perpendicular to the line $x + y = 0$
(c) Passing through the point $(2, 4)$
(d) Parallel to the x-axis
31. The midpoint of a line segment is $(-1, 4)$. If one end of the line segment is $(2, 3)$, find the other end.
32. Find the point that is equidistant from $(0, 0)$, $(2, 3)$, and $(3, -2)$.

In Exercises 33 and 34, find the point(s) of intersection of the graphs of the given equations.

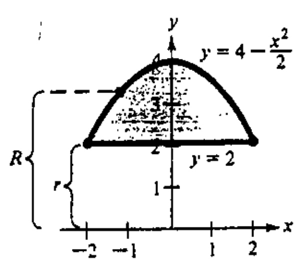
33. $3x - 4y = 8$, $x + y = 5$
34. $x - y + 1 = 0$, $y - x^2 = 7$

In Exercises 35–40, find a formula for the given function and find the domain.

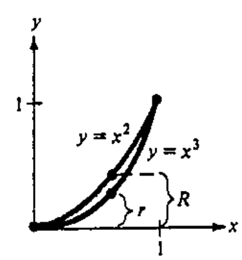
35. The value v of a farm at \$850 per acre, with buildings, livestock, and equipment worth \$300,000, is a function of the number of acres a.
36. The value v of wheat at \$3.25 per bushel is a function of the number of bushels b.
37. The surface area s of a cube is a function of the length of an edge x.
38. The surface area s of a sphere is a function of the radius r.
39. The distance d traveled by a car at a speed of 45 miles per hour is a function of the time traveled t.
40. The area a of an equilateral triangle is a function of the length of one of its sides x.

In Exercises 41–44, express the indicated values as functions of x.

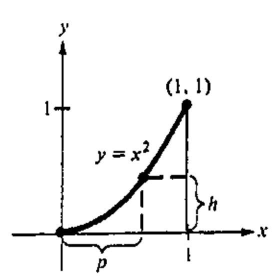
41. R and r



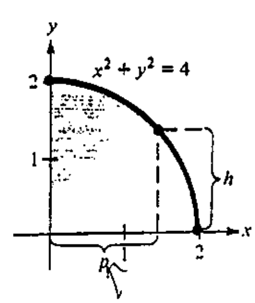
42. R and r



43. h and p



44. h and p



45. The sum of two positive numbers is 500. Let one of the numbers be x, and express the product P of the two numbers as a function of x.
46. The product of two positive numbers is 120. Let one of the numbers be x, and express the sum of the two numbers as a function of x.

In Exercises 47–52, sketch the graph of the given equation and use the vertical line test to determine if the equation expresses y as a function of x.

47. $x^2 - y = 0$

48. $x^2 + 4y^2 = 16$

49. $x - y^2 = 0$

50. $x^3 - y^2 + 1 = 0$

51. $y = x^2 - 2x$

52. $y = 36 - x^2$

53. Given $f(x) = 1 - x^2$ and $g(x) = 2x + 1$, find
   (a) $f(x) + g(x)$
   (b) $f(x) - g(x)$
   (c) $f(x)g(x)$
   (d) $\dfrac{f(x)}{g(x)}$
   (e) $f(g(x))$
   (f) $g(f(x))$

54. Given $f(x) = 2x - 3$ and $g(x) = \sqrt{x + 1}$, find
   (a) $f(x) + g(x)$
   (b) $f(x) - g(x)$
   (c) $f(x)g(x)$
   (d) $\dfrac{f(x)}{g(x)}$
   (e) $f(g(x))$
   (f) $g(f(x))$

55. Sales representatives for a certain company are required to use their own cars for transportation. The cost to the company is \$100 per day for lodging and meals plus \$0.25 per mile driven. Write a linear equation expressing the daily cost C to the company in terms of x, the number of miles driven.

56. A contractor purchases for \$26,500 a piece of equipment that costs an average of \$5.25 per hour for fuel and maintenance. The equipment operator is paid \$9.50 per hour, and customers are charged \$25 per hour.
   (a) Write an equation for the cost C of operating this equipment t hours.
   (b) Write an equation for the revenue R derived from t hours of use.
   (c) Find the break-even point for this equipment by finding the time at which $R = C$.

In Exercises 57 and 58, use a calculator to evaluate the given trigonometric functions to four significant figures.

57. (a) tan 240°
   (b) cot 210°
   (c) sin (−0.65)

58. (a) sin (5.63)
   (b) csc (2.62)
   (c) csc 150°

In Exercises 59–62, find two values of θ corresponding to the given function. List θ in degrees ($0 \le \theta < 360°$) and radians ($0 \le \theta < 2\pi$).

59. $\sin\theta = -\dfrac{1}{2}$

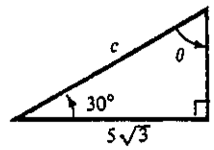
60. $\csc\theta = \sqrt{2}$

61. $\cos\theta = -\dfrac{\sqrt{3}}{2}$

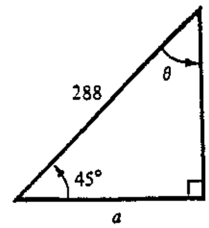
62. $\tan\theta = -\dfrac{1}{\sqrt{3}}$

In Exercises 63–68, solve the given triangle for the indicated side and/or angle.

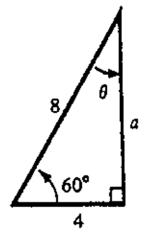
63.



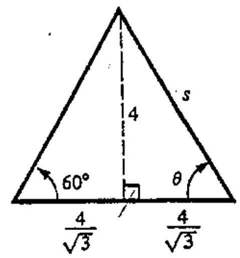
64.



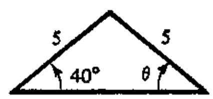
65.



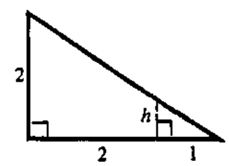
66.



67.



68.



69. A six-foot person standing 12 feet from a streetlight casts an 8-foot shadow as shown in Figure 1.87. What is the height of the streetlight?

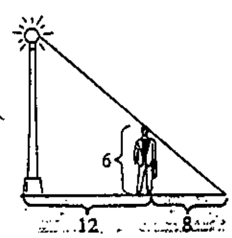


FIGURE 1.87

70. A guy wire is stretched from a broadcasting tower at a point 200 feet above the ground to an anchor 125 feet from the base of the tower as shown in Figure 1.88. How long is the wire?

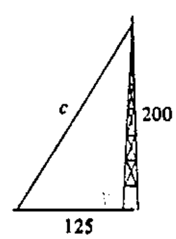


FIGURE 1.88

In Exercises 71–78, sketch a graph showing two periods for the given function.

71. $f(x) = 2 \sin \frac{2x}{3}$

72. $f(x) = \frac{1}{2} \cos \frac{x}{3}$

73. $f(x) = \cos \left(2x - \frac{\pi}{3}\right)$

74. $f(x) = -\sin \left(2x + \frac{\pi}{2}\right)$

75. $f(x) = \tan \frac{x}{2}$

76. $f(x) = \csc 2x$

77. $f(x) = \sec \left(x - \frac{\pi}{4}\right)$

78. $f(x) = \cot 3x$

79. The monthly sales S in thousands of units of a seasonal product are approximated by

$$S = 74.50 + 43.75 \sin \frac{\pi t}{6}$$

where t is the time in months with $t = 1$ corresponding to January. Sketch the graph of this sales function over one year.

80. The function

$$P = 100 - 20 \cos \frac{5\pi t}{3}$$

approximates the blood pressure P (in millimeters of mercury) for a person at rest. (The time t is measured in seconds.)

(a) Find the period of this function.
(b) Find the number of heartbeats per minute for this individual.
(c) Sketch the graph of this pressure function.

81. The average daily temperature (in degrees Fahrenheit) for a certain city is given by

$$T = 45 - 23 \cos \left[\frac{2\pi}{365}(t - 32)\right]$$

where t is the time in days with $t = 1$ corresponding to January 1. Find the average temperature on the following days.

(a) January 1
(b) July 4 ($t = 185$)
(c) October 18 ($t = 291$)

82. A company that produces a seasonal product forecasts monthly sales over the next two years to be

$$S = 23.1 + 0.442t + 4.3 \sin \frac{\pi t}{6}$$

where S is measured in thousands of units and t is the time in months with $t = 1$ representing January 1984. Predict the sales for the following months.

(a) February 1984
(b) February 1985
(c) September 1984
(d) September 1985