general linear equation (p. 6)
graph of a function (p. 13)
graph of a relation (p. 29)
grapher failure (p. 15)
half-life (p. 24)
half-open interval (p. 14)
identity function (p. 37)
implied domain (p. 14)
increments (p. 3)
independent variable (p. 13)
initial point of parametrized curve (p. 29)
interior of an interval (p. 14)
interior points of an interval (p. 14)
inverse cosecant function (p. 49)
inverse cosine function (p. 49)
inverse cotangent function (p. 49)
inverse function (p. 37)
inverse properties for a^x and $\log_a x$ (p. 40)
inverse secant function (p. 49)
inverse sine function (p. 49)
inverse tangent function (p. 49)
linear function (p. 4)
natural logarithm function (p. 40)
odd function (p. 16)
one-to-one function (p. 36)
open interval (p. 14)
parallel lines (p. 6)
parameter (p. 29)
parameter interval (p. 29)
parametric curve (p. 29)
parametric equations (p. 29)
parametrization of a curve (p. 29)
parametrize (p. 29)
period of a function (p. 46)
periodic function (p. 46)
perpendicular lines (p. 6)
piecewise-defined function (p. 17)
point-slope equation (p. 5)
power function (p. 15)
power rule for logarithms (p. 40)
product rule for logarithms (p. 40)
quotient rule for logarithms (p. 40)
radian measure (p. 45)
range (p. 13)
relation (p. 29)
relevant domain (p. 14)
rules for exponents (p. 24)
secant function (p. 45)
sine function (p. 45)
sinusoid (p. 47)
slope (p. 4)
slope-intercept equation (p. 6)
symmetry about the origin (p. 16)
symmetry about the y-axis (p. 16)
tangent function (p. 45)
terminal point of parametrized curve (p. 29)
witch of Agnesi (p. 32)
x-intercept (p. 6)
y-intercept (p. 6)

CHAPTER 1 Review Exercises

Exercise numbers with a gray background indicate problems that the authors have designed to be solved without a calculator.

The collection of exercises marked in red could be used as a chapter test.

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. $y = \ln(x - 3) + 1$

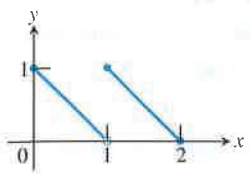
36. $y = -1 + \sqrt[3]{2 - x}$

37. $y = \begin{cases} \sqrt{-x}, & -4 \le x \le 0 \\ \sqrt{x}, & 0 < x \le 4 \end{cases}$

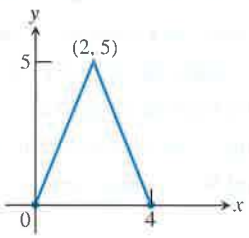
38. $y = \begin{cases} -x - 2, & -2 \le x \le -1 \\ x, & -1 < x \le 1 \\ -x + 2, & 1 < x \le 2 \end{cases}$

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. $f(x) = \dfrac{1}{x}, \quad g(x) = \dfrac{1}{\sqrt{x+2}}$

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

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

44. $f(x) = \sqrt{x}, \quad g(x) = \sqrt{1-x}$

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. $x = 5\cos t, \quad y = 2\sin t, \quad 0 \le t \le 2\pi$

46. $x = 4\cos t, \quad y = 4\sin t, \quad \pi/2 \le t < 3\pi/2$

47. $x = 2 - t, \quad y = 11 - 2t, \quad -2 \le t \le 4$

48. $x = 1 + t, \quad y = \sqrt{4 - 2t}, \quad t \le 2$

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. $y = x(x - 4), \quad x \le 2$

Group Activity In Exercises 53 and 54, do the following.

(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.** $f(x) = (x + 2)^2, \quad x \ge -2$

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 function 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: $e^{-0.2x} = 4$

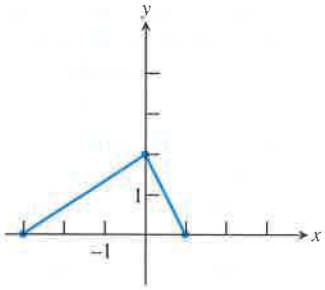
60. The graph of f is shown. Draw the graph of each function.

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

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

(c) $y = -2f(x + 1) + 1$

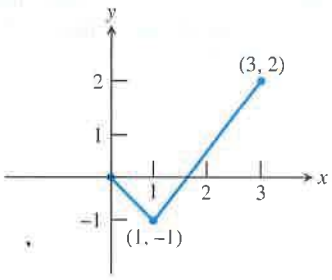
(d) $y = 3f(x - 2) - 2$



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. ***The Rule of 70*** A well-known rule in the world of finance is that an annual interest rate of $R\%$ will double an investment in approximately $70/R$ years. Assume that the money is compounded continuously so that you can use the Pe^{rt} formula.

(a) Solve the equation $Pe^{rt} = 2P$ to find t as a function of r.

(b) If $r = R\%$, write t as a function of R.

(c) If the money is not compounded continuously, the doubling time will be a little longer than the answer in (b). Approximate the typical doubling time by increasing the numerator by 1. This should explain the Rule of 70!

67. **Writing to Learn** Many people refer to the Rule of 70 (see Exercise 66) as the ***Rule of 72.*** Since this is usually less accurate, why do you suppose some people prefer it?

AP* Examination Preparation

You may use a graphing calculator to solve the following problems.

68. Consider the point $P(-2, 1)$ and the line L: $x + y = 2$.

(a) Find the slope of L.

(b) Write an equation for the line through P and parallel to L.

(c) Write an equation for the line through P and perpendicular to L.

(d) What is the x-intercept of L?

69. Let $f(x) = 1 - \ln(x - 2)$.

(a) What is the domain of f?

(b) What is the range of f?

(c) What are the x-intercepts of the graph of f?

(d) Find f^{-1}.

(e) Confirm your answer algebraically in part (d).

70. Let $f(x) = 1 - 3\cos(2x)$.

(a) What is the domain of f?

(b) What is the range of f?

(c) What is the period of f?

(d) Is f an even function, odd function, or neither?

(e) Find all the zeros of f in $\pi/2 \le x \le \pi$.