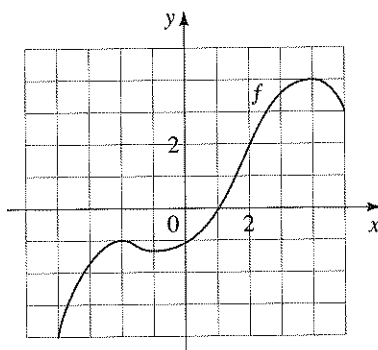


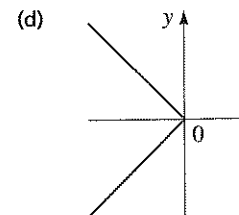
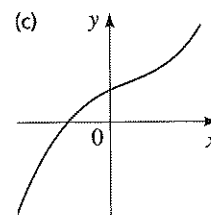
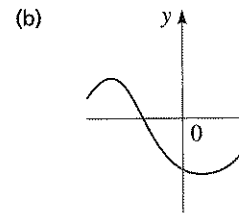
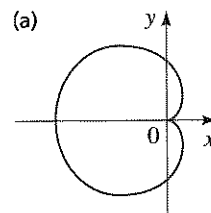
6. How is the average rate of change of the function f between two points defined?
7. Define each concept in your own words.
- Increasing function
 - Decreasing function
 - Constant function
8. Suppose the graph of f is given. Write an equation for each graph that is obtained from the graph of f as follows.
- Shift 3 units upward.
 - Shift 3 units downward.
 - Shift 3 units to the right.
 - Shift 3 units to the left.
 - Reflect in the x -axis.
 - Reflect in the y -axis.
 - Stretch vertically by a factor of 3.
 - Shrink vertically by a factor of $\frac{1}{3}$.
9. (a) What is an even function? What symmetry does its graph possess? Give an example of an even function.
 (b) What is an odd function? What symmetry does its graph possess? Give an example of an odd function.
10. Write the standard form of a quadratic function.
11. What does it mean to say that $f(3)$ is a local maximum value of f ?
12. Suppose that f has domain A and g has domain B .
- What is the domain of $f + g$?
 - What is the domain of fg ?
 - What is the domain of f/g ?
13. How is the composite function $f \circ g$ defined?
14. (a) What is a one-to-one function?
 (b) How can you tell from the graph of a function if it is one-to-one?
 (c) Suppose f is a one-to-one function with domain A and range B . How is the inverse function f^{-1} defined? What is the domain of f^{-1} ? What is the range of f^{-1} ?
 (d) If you are given a formula for f , how do you find a formula for f^{-1} ?
 (e) If you are given the graph of f , how do you find the graph of f^{-1} ?

EXERCISES

1. If $f(x) = x^2 - x + 1$, find $f(0)$, $f(2)$, $f(-2)$, $f(a)$, $f(-a)$, $f(x + 1)$, $f(2x)$, and $2f(x) - 2$.
2. If $f(x) = 1 + \sqrt{x - 1}$, find $f(5)$, $f(9)$, $f(a + 1)$, $f(-x)$, $f(x^2)$, and $[f(x)]^2$.
3. The graph of a function is given.
- Find $f(-2)$ and $f(2)$.
 - Find the domain of f .
 - Find the range of f .
 - On what intervals is f increasing? On what intervals is f decreasing?
 - Is f one-to-one?



4. Which of the following figures are graphs of functions? Which of the functions are one-to-one?



- 5-6 ■ Find the domain and range of the function.

5. $f(x) = \sqrt{x + 3}$

6. $F(t) = t^2 + 2t + 5$

7-14 ■ Find the domain of the function.

7. $f(x) = 7x + 15$

8. $f(x) = \frac{2x + 1}{2x - 1}$

9. $f(x) = \sqrt{x + 4}$

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

11. $f(x) = \frac{1}{x} + \frac{1}{x + 1} + \frac{1}{x + 2}$

12. $g(x) = \frac{2x^2 + 5x + 3}{2x^2 - 5x - 3}$

13. $h(x) = \sqrt{4 - x} + \sqrt{x^2 - 1}$

14. $f(x) = \frac{\sqrt[3]{2x + 1}}{\sqrt[3]{2x + 2}}$

15-32 ■ Sketch the graph of the function.

15. $f(x) = 1 - 2x$

16. $f(x) = \frac{1}{3}(x - 5), \quad 2 \leq x \leq 8$

17. $f(t) = 1 - \frac{1}{2}t^2$

18. $g(t) = t^2 - 2t$

19. $f(x) = x^2 - 6x + 6$

20. $f(x) = 3 - 8x - 2x^2$

21. $y = 1 - \sqrt{x}$

22. $y = -|x|$

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

24. $y = \sqrt{x + 3}$

25. $h(x) = \sqrt[3]{x}$

26. $H(x) = x^3 - 3x^2$

27. $g(x) = \frac{1}{x^2}$

28. $G(x) = \frac{1}{(x - 3)^2}$

29. $f(x) = \begin{cases} 1 - x & \text{if } x < 0 \\ 1 & \text{if } x \geq 0 \end{cases}$

30. $f(x) = \begin{cases} 1 - 2x & \text{if } x \leq 0 \\ 2x - 1 & \text{if } x > 0 \end{cases}$

31. $f(x) = \begin{cases} x + 6 & \text{if } x < -2 \\ x^2 & \text{if } x \geq -2 \end{cases}$

32. $f(x) = \begin{cases} -x & \text{if } x < 0 \\ x^2 & \text{if } 0 \leq x < 2 \\ 1 & \text{if } x \geq 2 \end{cases}$

33. Determine which viewing rectangle produces the most appropriate graph of the function

$f(x) = 6x^3 - 15x^2 + 4x - 1.$

(i) $[-2, 2]$ by $[-2, 2]$

(ii) $[-8, 8]$ by $[-8, 8]$

(iii) $[-4, 4]$ by $[-12, 12]$

(iv) $[-100, 100]$ by $[-100, 100]$

34. Determine which viewing rectangle produces the most appropriate graph of the function $f(x) = \sqrt{100 - x^2}.$

(i) $[-4, 4]$ by $[-4, 4]$

(ii) $[-10, 10]$ by $[-10, 10]$

(iii) $[-10, 10]$ by $[-10, 40]$

(iv) $[-100, 100]$ by $[-100, 100]$

35-38 ■ Draw the graph of the function in an appropriate viewing rectangle.

35. $f(x) = x^2 + 25x + 173$

36. $f(x) = 1.1x^3 - 9.6x^2 - 1.4x + 3.2$

37. $y = \frac{x}{\sqrt{x^2 + 16}}$

38. $y = |x(x + 2)(x + 4)|$

39. Find, approximately, the domain of the function

$f(x) = \sqrt{x^3 - 4x + 1}.$

40. Find, approximately, the range of the function

$f(x) = x^4 - x^3 + x^2 + 3x - 6.$

41. Suppose that M varies directly as z , and $M = 120$ when $z = 15$. Write an equation that expresses this variation.

42. Suppose that z is inversely proportional to y , and that $z = 12$ when $y = 16$. Write an equation that expresses z in terms of y .

43. The intensity of illumination I from a light varies inversely as the square of the distance d from the light.

(a) Write this statement as an equation.

(b) Determine the constant of proportionality if it is known that a lamp has an intensity of 1000 candles at a distance of 8 m.

(c) What is the intensity of this lamp at a distance of 20 m?

44. The frequency of a vibrating string under constant tension is inversely proportional to its length. If a violin string 12 inches long vibrates 440 times per second, to what length would it have to be shortened to vibrate 660 times per second?

45. The terminal velocity of a parachutist is directly proportional to the square root of his weight. A 160-lb parachutist attains a terminal velocity of 9 mi/h. What is the terminal velocity for a parachutist weighing 240 lb?

46. The maximum range of a projectile is directly proportional to the square of its velocity. A baseball pitcher can throw a ball at 60 mi/h, with a maximum range of 242 ft. What would his maximum range be if he could throw the ball at 70 mi/h?