

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

7. $f(x) = \frac{x^2 - 4}{x^2}$

8. $f(x) = \frac{x^3}{x^2 - 9}$

In Problems 9–16, find the domain of each function.

9. $f(x) = \frac{x}{x^2 - 9}$

10. $f(x) = \frac{3x^2}{x - 2}$

11. $f(x) = \sqrt{2 - x}$

12. $f(x) = \sqrt{x + 2}$

13. $h(x) = \frac{\sqrt{x}}{|x|}$

14. $g(x) = \frac{|x|}{x}$

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

16. $F(x) = \frac{1}{x^2 - 3x}$

In Problems 17–22, find $f + g$, $f - g$, $f \cdot g$, and $\frac{f}{g}$ for each pair of functions. State the domain of each one.

17. $f(x) = 2 - x$; $g(x) = 3x + 1$

18. $f(x) = 2x - 1$; $g(x) = 2x + 1$

19. $f(x) = 3x^2 + x + 1$; $g(x)$

20. $f(x) = 3x$; $g(x) = 1 + x + x^2$

21. $f(x) = \frac{x + 1}{x - 1}$; $g(x) = \frac{1}{x}$

22. $f(x) = \frac{1}{x - 3}$; $g(x) = \frac{3}{x}$

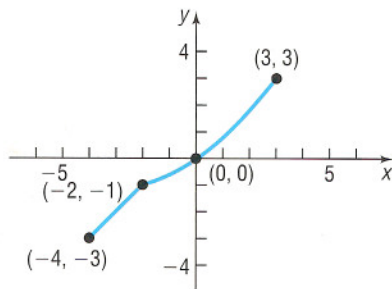
In Problems 23 and 24, find the difference quotient of each function f ; that is, find

$$\frac{f(x + h) - f(x)}{h} \quad h \neq 0$$

23. $f(x) = -2x^2 + x + 1$

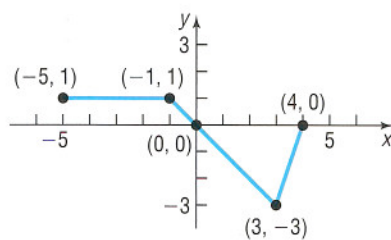
24. $f(x) = 3x^2 - 2x + 4$

25. Using the graph of the function f shown:



- Find the domain and the range of f .
- List the intercepts.
- Find $f(-2)$.
- For what value of x does $f(x) = -3$?
- Solve $f(x) > 0$.
- Graph $y = f(x - 3)$.
- Graph $y = f\left(\frac{1}{2}x\right)$.
- Graph $y = -f(x)$.

26. Using the graph of the function g shown:

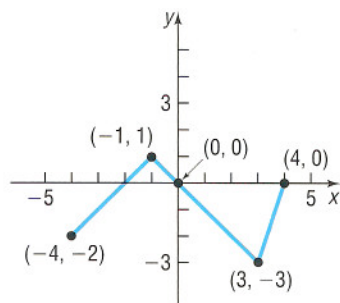


- Find the domain and the range of g .
- Find $g(-1)$.
- List the intercepts.
- For what value of x does $g(x) = -3$?
- Solve $g(x) > 0$.
- Graph $y = g(x - 2)$.
- Graph $y = g(x) + 1$.
- Graph $y = 2g(x)$.

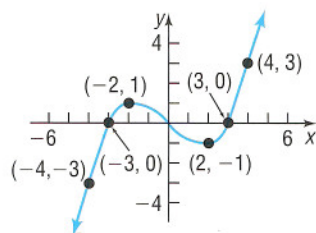
In Problems 27 and 28, use the graph of the function f to find:

- The domain and the range of f .
- The intervals on which f is increasing, decreasing, or constant.
- The local minima and local maxima.
- Whether the graph is symmetric with respect to the x -axis, the y -axis, or the origin.
- Whether the function is even, odd, or neither.
- The intercepts, if any.

27.



28.



Problems 29–36, determine (algebraically) whether the given function is even, odd, or neither.

29. $f(x) = x^3 - 4x$

30. $g(x) = \frac{4 + x^2}{1 + x^4}$

31. $h(x) = \frac{1}{x^4} + \frac{1}{x^2} + 1$

32. $F(x) = \sqrt{1 - x^3}$

33. $G(x) = 1 - x + x^3$

34. $H(x) = 1 + x + x^2$

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

36. $g(x) = \frac{1 + x^2}{x^3}$

Problems 37–40, use a graphing utility to graph each function over the indicated interval. Approximate any local maxima and minima. Determine where the function is increasing and where it is decreasing.

37. $f(x) = 2x^3 - 5x + 1 \quad (-3, 3)$

38. $f(x) = -x^3 + 3x - 5 \quad (-3, 3)$

39. $f(x) = 2x^4 - 5x^3 + 2x + 1 \quad (-2, 3)$

40. $f(x) = -x^4 + 3x^3 - 4x + 3 \quad (-2, 3)$

Problems 41 and 42, find the average rate of change of f :

From 1 to 2 (b) From 0 to 1 (c) From 2 to 4

41. $f(x) = 8x^2 - x$

42. $f(x) = 2x^3 + x$

Problems 43–46, find the average rate of change from 2 to 3 for each function f . Be sure to simplify.

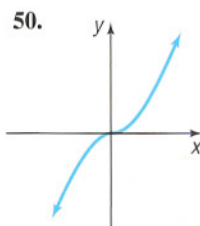
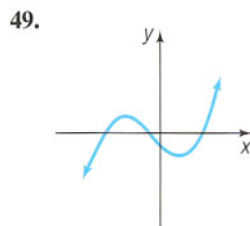
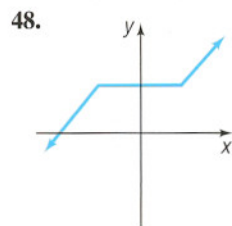
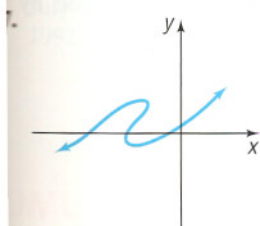
43. $f(x) = 2 - 5x$

44. $f(x) = 2x^2 + 7$

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

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

Problems 47–50, is the graph shown the graph of a function?



Problems 51–54, sketch the graph of each function. Be sure to label at least three points.

51. $f(x) = |x|$

52. $f(x) = \sqrt[3]{x}$

53. $f(x) = \sqrt{x}$

54. $f(x) = \frac{1}{x}$

Problems 55–66, graph each function using the techniques of shifting, compressing or stretching, and reflections. Identify any intercepts on the graph. State the domain and, based on the graph, find the range.

55. $F(x) = |x| - 4$

56. $f(x) = |x| + 4$

57. $g(x) = -2|x|$

58. $g(x) = \frac{1}{2}|x|$

59. $h(x) = \sqrt{x - 1}$

60. $h(x) = \sqrt{x} - 1$

61. $f(x) = \sqrt{1 - x}$

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

63. $h(x) = (x - 1)^2 + 2$

64. $h(x) = (x + 2)^2 - 3$

65. $g(x) = 3(x - 1)^3 + 1$

66. $g(x) = -2(x + 2)^3 - 8$

Problems 67–70,

Find the domain of each function.

Graph each function.

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

68. $f(x) = \begin{cases} x & \text{if } -4 \leq x < 0 \\ 1 & \text{if } x = 0 \\ 3x & \text{if } x > 0 \end{cases}$

(b) Locate any intercepts.

(d) Based on the graph, find the range.

69. $f(x) = \begin{cases} x - 1 & \text{if } -3 < x < 0 \\ 3x - 1 & \text{if } x \geq 0 \end{cases}$

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

A function f is defined by

$$f(x) = \frac{Ax + 5}{6x - 2}$$

If $f(1) = 4$, find A .

72. A function g is defined by

$$g(x) = \frac{A}{x} + \frac{8}{x^2}$$

If $g(-1) = 0$, find A .