

$$x + 2$$

$$x + 4$$

In Exercises 57–60, find the constants a and b such that the function is continuous on the entire real line.

$$57. f(x) = \begin{cases} x^3, & x \leq 2 \\ ax^2, & x > 2 \end{cases} \quad 58. g(x) = \begin{cases} 4 \sin x, & x < 0 \\ x, & x = 0 \\ a - 2x, & x > 0 \end{cases}$$

$$59. f(x) = \begin{cases} 2, & x \leq -1 \\ ax + b, & -1 < x < 3 \\ -2, & x \geq 3 \end{cases}$$

$$60. g(x) = \begin{cases} x^2 - a^2, & x \neq a \\ 8, & x = a \end{cases}$$

In Exercises 61–64, discuss the continuity of the composite function $h(x) = f(g(x))$.

$$61. f(x) = x^2$$

$$g(x) = x - 1$$

$$62. f(x) = \frac{1}{\sqrt{x}}$$


$$g(x) = x - 1$$

$$63. f(x) = \frac{1}{x - 6}$$

$$g(x) = x^2 + 5$$

$$64. f(x) = \sin x$$

$$g(x) = x^2$$

 In Exercises 65–68, use a graphing utility to graph the function. Use the graph to determine any x -values at which the function is not continuous.

$$65. f(x) = \llbracket x \rrbracket - x$$

$$66. h(x) = \frac{1}{x^2 - x - 2}$$

$$67. g(x) = \begin{cases} 2x - 4, & x \leq 3 \\ x^2 - 2x, & x > 3 \end{cases}$$

$$68. f(x) = \begin{cases} \cos x - 1, & x < 0 \\ x, & x = 0 \\ 5x, & x > 0 \end{cases}$$

In Exercises 29–32, discuss the continuity of the function on the closed interval.

$$29. g(x) = \sqrt{25 - x^2}, \quad [-5, 5]$$

$$30. f(t) = 3 - \sqrt{9 - t^2}, \quad [-3, 3]$$

$$31. f(x) = \begin{cases} 3 - x, & x \leq 0 \\ 3 + \frac{1}{2}x, & x > 0 \end{cases}, \quad [-1, 4]$$

$$32. g(x) = \frac{1}{x^2 - 4}, \quad [-1, 2]$$

In Exercises 33–54, find the x -values (if any) at which f is not continuous. Which of the discontinuities are removable?

$$33. f(x) = x^2 - 2x + 1$$

$$34. f(x) = \frac{1}{x^2 + 1}$$

$$35. f(x) = 3x - \cos x$$

$$36. f(x) = \cos \frac{\pi x}{2}$$

$$37. f(x) = \frac{x}{x^2 - x}$$

$$38. f(x) = \frac{x}{x^2 - 1}$$

$$39. f(x) = \frac{x}{x^2 + 1}$$

$$40. f(x) = \frac{x - 3}{x^2 - 9}$$

$$41. f(x) = \frac{x + 2}{x^2 - 3x - 10}$$

$$42. f(x) = \frac{x - 1}{x^2 + x - 2}$$

$$43. f(x) = \frac{|x + 2|}{x + 2}$$

$$44. f(x) = \frac{|x - 3|}{x - 3}$$

$$45. f(x) = \begin{cases} x, & x \leq 1 \\ x^2, & x > 1 \end{cases}$$

$$46. f(x) = \begin{cases} -2x + 3, & x < 1 \\ x^2, & x \geq 1 \end{cases}$$

$$47. f(x) = \begin{cases} \frac{1}{2}x + 1, & x \leq 2 \\ 3 - x, & x > 2 \end{cases}$$