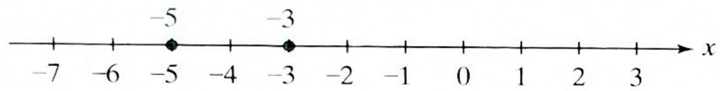
Fill in each blank so that the resulting statement is true.

1. We solve the polynomial inequality $x^2 + 8x + 15 > 0$ by first solving the equation _________________. The real solutions of this equation, -5 and -3, shown on the number line, are called ____________ points.



2. The points at -5 and -3 shown in Exercise 1 divide the number line into three intervals:

   ____________, ____________, ____________.

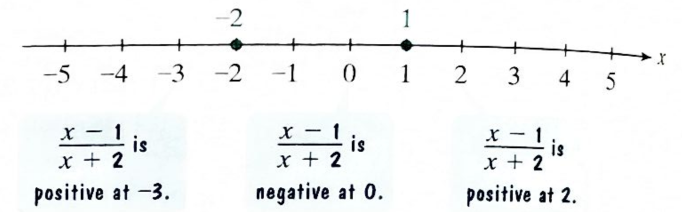
3. True or false: A test value for the leftmost interval on the number line shown in Exercise 1 could be -10. ________

4. True or false: A test value for the rightmost interval on the number line shown in Exercise 1 could be 0. ________

5. Consider the rational inequality

$$\frac{x-1}{x+2} \geq 0.$$

Setting the numerator and the denominator of $\frac{x-1}{x+2}$ equal to zero, we obtain $x = 1$ and $x = -2$. These values are shown as points on the number line. Also shown is information about three test values.



Based on the information shown above, the solution set of $\frac{x-1}{x+2} \geq 0$ is _________________.

EXERCISE SET 3.6

Practice Exercises

Solve each polynomial inequality in Exercises 1–42 and graph the solution set on a real number line. Express each solution set in interval notation.

1. $(x - 4)(x + 2) > 0$
2. $(x + 3)(x - 5) > 0$
3. $(x - 7)(x + 3) \leq 0$
4. $(x + 1)(x - 7) \leq 0$
5. $x^2 - 5x + 4 > 0$
6. $x^2 - 4x + 3 < 0$
7. $x^2 + 5x + 4 > 0$
8. $x^2 + x - 6 > 0$
9. $x^2 - 6x + 9 < 0$
10. $x^2 - 2x + 1 > 0$
11. $3x^2 + 10x - 8 \leq 0$
12. $9x^2 + 3x - 2 \geq 0$
13. $2x^2 + x < 15$
14. $6x^2 + x > 1$
15. $4x^2 + 7x < -3$
16. $3x^2 + 16x < -5$

17. $5x \leq 2 - 3x^2$
18. $4x^2 + 1 \geq 4x$
19. $x^2 - 4x \geq 0$
20. $x^2 + 2x < 0$
21. $2x^2 + 3x > 0$
22. $3x^2 - 5x \leq 0$
23. $-x^2 + x \geq 0$
24. $-x^2 + 2x \geq 0$
25. $x^2 \leq 4x - 2$
26. $x^2 \leq 2x + 2$
27. $9x^2 - 6x + 1 < 0$
28. $4x^2 - 4x + 1 \geq 0$
29. $(x - 1)(x - 2)(x - 3) \geq 0$
30. $(x + 1)(x + 2)(x + 3) \geq 0$
31. $x(3 - x)(x - 5) \leq 0$
32. $x(4 - x)(x - 6) \leq 0$
33. $(2 - x)^2\left(x - \frac{7}{2}\right) < 0$
34. $(5 - x)^2\left(x - \frac{13}{2}\right) < 0$
35. $x^3 + 2x^2 - x - 2 \geq 0$
36. $x^3 + 2x^2 - 4x - 8 \geq 0$
37. $x^3 - 3x^2 - 9x + 27 < 0$
38. $x^3 + 7x^2 - x - 7 < 0$
39. $x^3 + x^2 + 4x + 4 > 0$
40. $x^3 - x^2 + 9x - 9 > 0$
41. $x^3 \geq 9x^2$
42. $x^3 \leq 4x^2$

Solve each rational inequality in Exercises 43–60 and graph the solution set on a real number line. Express each solution set in interval notation.

43. $\frac{x - 4}{x + 3} > 0$
44. $\frac{x + 5}{x - 2} > 0$
45. $\frac{x + 3}{x + 4} < 0$
46. $\frac{x + 5}{x + 2} < 0$
47. $\frac{-x + 2}{x - 4} \geq 0$
48. $\frac{-x - 3}{x + 2} \leq 0$
49. $\frac{4 - 2x}{3x + 4} \leq 0$
50. $\frac{3x + 5}{6 - 2x} \geq 0$
51. $\frac{x}{x - 3} > 0$
52. $\frac{x + 4}{x} > 0$
53. $\frac{(x + 4)(x - 1)}{x + 2} \leq 0$
54. $\frac{(x + 3)(x - 2)}{x + 1} \leq 0$
55. $\frac{x + 1}{x + 3} < 2$
56. $\frac{x}{x - 1} > 2$
57. $\frac{x + 4}{2x - 1} \leq 3$
58. $\frac{1}{x - 3} < 1$
59. $\frac{x - 2}{x + 2} \leq 2$
60. $\frac{x}{x + 2} \geq 2$

Practice Plus

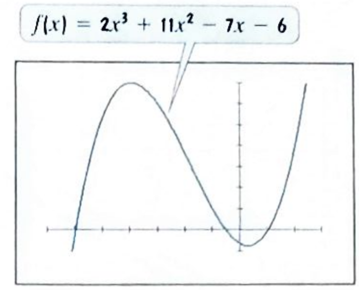
In Exercises 61–64, find the domain of each function.

61. $f(x) = \sqrt{2x^2 - 5x + 2}$
62. $f(x) = \frac{1}{\sqrt{4x^2 - 9x + 2}}$
63. $f(x) = \sqrt{\frac{2x}{x + 1} - 1}$
64. $f(x) = \sqrt{\frac{x}{2x - 1} - 1}$

Solve each inequality in Exercises 65–70 and graph the solution set on a real number line.

65. $|x^2 + 2x - 36| > 12$
66. $|x^2 + 6x + 1| > 8$
67. $\frac{3}{x + 3} > \frac{3}{x - 2}$
68. $\frac{1}{x + 1} > \frac{2}{x - 1}$
69. $\frac{x^2 - x - 2}{x^2 - 4x + 3} > 0$
70. $\frac{x^2 - 3x + 2}{x^2 - 2x - 3} > 0$

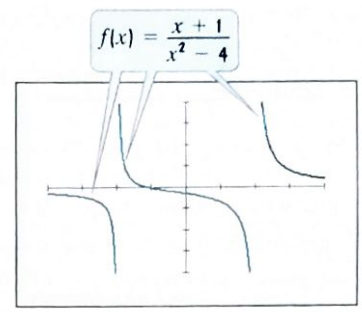
In Exercises 71–72, use the graph of the polynomial function to solve each inequality.



[−7, 3, 1] by [−10, 70, 10]

71. $2x^3 + 11x^2 \geq 7x + 6$
72. $2x^3 + 11x^2 < 7x + 6$

In Exercises 73–74, use the graph of the rational function to solve each inequality.



[−4, 4, 1] by [−4, 4, 1]

73. $\frac{1}{4(x + 2)} \leq -\frac{3}{4(x - 2)}$
74. $\frac{1}{4(x + 2)} > -\frac{3}{4(x - 2)}$

Application Exercises

Use the position function

$$s(t) = -16t^2 + v_0 t + s_0$$

(v_0 = initial velocity, s_0 = initial position, t = time)

to answer Exercises 75–76.

75. Divers in Acapulco, Mexico, dive headfirst at 8 feet per second from the top of a cliff 87 feet above the Pacific Ocean. During which time period will a diver's height exceed that of the cliff?

76. You throw a ball straight up from a rooftop 160 feet high with an initial velocity of 48 feet per second. During which time period will the ball's height exceed that of the rooftop?

The functions

$$f(x) = 0.0875x^2 - 0.4x + 66.6$$

Dry pavement

and

Wet pavement

$$g(x) = 0.0875x^2 + 1.9x + 11.6$$

model a car's stopping distance, f(x) or g(x), in feet, traveling at x miles per hour. Function f models stopping distance on dry pavement and function g models stopping distance on wet pavement. The graphs of these functions are shown for