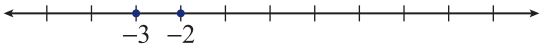

we have the intervals $(-\infty, -3)$, $(-3, -2)$, and $(-2, \infty)$.

Interval	Test Point	Evaluate	Result
$(-\infty, -3)$	$x = -4$	$f(-4) = \frac{(-4)+3}{(-4)+2} = \frac{1}{2}$	$f(x) > 0$ on $(-\infty, -3)$ **Positive**
$(-3, -2)$	$x = -2.5$	$f(-2.5) = \frac{(-2.5)+3}{(-2.5)+2} = -1$	$f(x) < 0$ on $(-3, -2)$ **Negative**
$(-2, \infty)$	$x = 0$	$f(0) = \frac{(0)+3}{(0)+2} = \frac{3}{2}$	$f(x) > 0$ on $(-2, \infty)$ **Positive**

The final step is to evaluate which intervals satisfy each inequality. The solution to the first inequality is the union of the two intervals where f is positive.

$$(-\infty, -3) \cup (-2, \infty)$$

For the second inequality, we have to decide which endpoints to include. We include $x = -3$, since this is a zero of the rational function, but we do not include $x = -2$, since the value is not in the domain of f. Thus, the solution to the second inequality is

$$(-\infty, -3] \cup (-2, \infty).$$

3.9 EXERCISES

PRACTICE

Solve the following rational inequalities. See Examples 1 and 2.

1. $\frac{x+4}{2x} \geq 0$

2. $\frac{x}{x-4} \geq 0$

3. $\frac{x+6}{x^2} < 0$

4. $\frac{3x^2}{x+1} < 0$

5. $\frac{x+3}{x+9} > 0$

6. $\frac{2x+3}{x-4} < 0$

7. $\frac{3x-6}{2x-5} < 0$

8. $\frac{4-3x}{2x+4} \leq 0$

9. $\frac{x+5}{x-7} \geq 1$

10. $\frac{2x+3}{x-1} > 2$

11. $\frac{2x+5}{x-4} \leq -3$

12. $\frac{3x+2}{4x-1} < 3$

13. $\frac{5-2x}{3x+4} < -1$

14. $\frac{8-x}{x+5} < -4$

15. $\frac{x(x+4)}{x-3} \leq 0$

16. $\frac{(x+3)(x-2)}{x+1} > 0$

17. $\frac{x-5}{x(x+2)} \geq 0$

18. $\frac{-(x-3)^2}{(x-1)(x-4)} < 0$

19. $2x < \frac{4}{x+1}$

20. $\frac{5}{x-2} \geq \frac{3x}{x-2}$

21. $\frac{5}{x-2} > \frac{3}{x+2}$

22. $\frac{x}{x^2-x-6} \leq \frac{-1}{x^2-x-6}$

23. $\frac{x}{x^2-x-6} \leq \frac{-2}{x^2-x-6}$

24. $x > \frac{1}{x}$

25. $\frac{4}{x-3} \leq \frac{4}{x}$

26. $\frac{x-7}{x-3} \geq \frac{x}{x-1}$

27. $\frac{x}{x^2+3x+2} > \frac{1}{x^2+3x+2}$

28. $\frac{1}{x-4} \geq \frac{1}{x+1}$

29. $\frac{x}{x+1} \geq \frac{x+1}{x}$

30. $\frac{x}{x^2-2x-3} > \frac{3}{x^2-2x-3}$

TECHNOLOGY

31. Use a graphing utility to graph the rational function $y = \frac{x^2+3x-4}{x}$.

a. Use the graph to find the solution set for $y \geq 0$.

b. Use the graph to find the solution set for $y < 0$.

c. Explain the effect of $x = 0$ on the graph and why $x = 0$ is not included in either parts **a.** or **b.**