7.1 Practice A

In Exercises 1–6, tell whether \( x \) and \( y \) show direct variation, inverse variation, or neither.

1. \( y = \frac{5}{x} \)  
2. \( xy = 7 \)  
3. \( 6x = y \)

4. \( \frac{y}{x} = 10 \)  
5. \( x + y = 8 \)  
6. \( 2y = x \)

In Exercises 7–10, tell whether \( x \) and \( y \) show direct variation, inverse variation, or neither.

7. \[
\begin{array}{cccc}
  x & 2 & 4 & 8 \\
  y & 38 & 19 & 9.5 \\
\end{array}
\]

8. \[
\begin{array}{cccc}
  x & 3 & 5 & 8 \\
  y & 15 & 9 & 6 \\
\end{array}
\]

9. \[
\begin{array}{cccc}
  x & 1.5 & 4 & 6.5 \\
  y & 9 & 24 & 39 \\
\end{array}
\]

10. \[
\begin{array}{cccc}
  x & 1.5 & 4 & 6 \\
  y & 84 & 31.5 & 21 \\
\end{array}
\]

In Exercises 11–13, the variables \( x \) and \( y \) vary inversely. Use the given values to write an equation relating \( x \) and \( y \). Then find \( y \) when \( x = 3 \).

11. \( x = 6, y = -5 \)  
12. \( x = 1, y = 7 \)  
13. \( x = 3, y = \frac{2}{3} \)

14. The variables \( x \) and \( y \) vary inversely. Describe and correct the error in writing an equation relating \( x \) and \( y \).

\[
\begin{align*}
  y &= a \\
  \frac{5}{6} &= a \\
  \text{So, } y &= \frac{5}{6x} 
\end{align*}
\]

15. The number \( y \) of songs that can be stored on an MP3 player varies inversely with the average size \( x \) of a song. A certain MP3 player can store 3000 songs when the average size of a song is 5 megabytes. Find the number of songs that will fit on the MP3 player when the average size of a song is 4 megabytes.
7.2 Practice A

In Exercises 1–3, graph the function. Compare the graph with the graph of
\( f(x) = \frac{1}{x} \).

1. \( h(x) = \frac{2}{x} \)
2. \( g(x) = \frac{9}{x} \)
3. \( h(x) = \frac{-4}{x} \)

In Exercises 4–15, graph the function. State the domain and range.

4. \( f(x) = \frac{3}{x} + 2 \)
5. \( y = \frac{5}{x} - 1 \)
6. \( g(x) = \frac{4}{x - 3} \)
7. \( y = \frac{1}{x + 4} \)
8. \( h(x) = \frac{-1}{x + 3} \)
9. \( y = \frac{-4}{x - 5} \)
10. \( f(x) = \frac{x + 3}{x - 2} \)
11. \( y = \frac{x - 5}{x + 3} \)
12. \( g(x) = \frac{x + 4}{2x - 6} \)
13. \( y = \frac{5x + 2}{3x - 9} \)
14. \( h(x) = \frac{-2x + 3}{3x + 4} \)
15. \( y = \frac{8x - 1}{5x - 1} \)

In Exercises 16–21, rewrite the function in the form \( g(x) = \frac{a}{x - h} + k \). Graph the function. Describe the graph of \( g \) as a transformation of the graph of \( f(x) = \frac{a}{x} \).

16. \( g(x) = \frac{4x + 5}{x + 1} \)
17. \( g(x) = \frac{6x + 5}{x - 2} \)
18. \( g(x) = \frac{3x - 6}{x - 4} \)
19. \( g(x) = \frac{5x - 12}{x + 2} \)
20. \( g(x) = \frac{x + 15}{x - 5} \)
21. \( g(x) = \frac{x + 3}{x - 9} \)

22. Your choir is taking a trip. The trip has an initial cost of $500, plus $150 for each student.
   a. Estimate how many students must go on the trip for the average cost per student to fall to $175.
   b. What happens to the average cost as more students go on the trip?

In Exercises 23–25, use a graphing calculator to graph the function. Then determine whether the function is even, odd, or neither.

23. \( f(x) = \frac{5}{x^2 - 1} \)
24. \( g(x) = \frac{3x^2}{x^2 + 4} \)
25. \( h(x) = \frac{x^3}{2x^2 + x^4} \)
7.3 Practice A

In Exercises 1–6, simplify the expression, if possible.

1. \( \frac{3x^2}{5x^2 + 2x} \)  
2. \( \frac{6x^4 - x^3}{2x^4} \)  
3. \( \frac{x^2 - 4x - 5}{x^2 - 7x + 10} \)  
4. \( \frac{x^2 - 3x}{x^2 + 5x + 6} \)  
5. \( \frac{x^2 - x - 2}{x^3 - 8} \)  
6. \( \frac{x^2 - 3x - 4}{x^3 + 1} \)

In Exercises 7–12, find the product.

7. \( \frac{54x^3y^2}{y^4} \cdot \frac{x^3y^2}{9x^5y^3} \)  
8. \( \frac{x^3(x + 2)}{x - 1} \cdot \frac{(x - 1)(x - 3)}{x^4} \)

9. \( \frac{x^2(x - 5)}{x + 7} \cdot \frac{(x + 7)(x - 1)}{4x^2} \)  
10. \( \frac{x^2 - 5x}{x + 3} \cdot \frac{x^2 + 4x + 3}{x} \)

11. \( \frac{x^2 + 3x}{x - 2} \cdot \frac{x^2 - 5x + 6}{4x} \)  
12. \( \frac{x^2 - 4x - 5}{x^2 + 6x + 9} \cdot \frac{2x^2 + 6x}{x^2 + 3x + 2} \)

13. Compare the function \( f(x) = \frac{(4x + 1)(x - 5)}{(4x + 1)} \) to the function \( g(x) = x - 5 \).

In Exercises 14–17, find the quotient.

14. \( \frac{28x^4y}{y^7} + \frac{y^9}{2x^5} \)  

15. \( \frac{x^2 - x - 6}{3x^4 + 6x^3} + \frac{x - 3}{6x^3} \)

16. \( \frac{4x^2 + 12x}{x^2 + 2x - 3} + \frac{4x}{5x - 5} \)  

17. \( \frac{x^2 + 5x - 14}{x + 3} + \frac{(x^2 - 4x + 4)}{} \)

18. Manufacturers often package products in a way that uses the least amount of material. One measure of the efficiency of a package is the ratio of its surface area to its volume. The smaller the ratio, the more efficient the packaging. A company makes a cylindrical can to hold popcorn. The company is designing a new can with the same height \( h \) and twice the radius \( r \) of the old can.

a. Write an expression for the efficiency ratio \( \frac{S}{V} \), where \( S \) is the surface area of the can and \( V \) is the volume of the can.

b. Find the efficiency ratio for each can.

c. Did the company make a good decision by creating the new can? Explain.
7.4 Practice A

In Exercises 1–3, find the sum or difference.

1. \( \frac{12}{5x} + \frac{3}{5x} \)
2. \( \frac{x}{9x^2} - \frac{3}{9x^2} \)
3. \( \frac{7}{x - 2} - \frac{3x}{x - 2} \)

In Exercises 4–7, find the least common multiple of the expressions.

4. \( 3x^2, 6x - 18 \)
5. \( 5x, 5x(x + 2) \)
6. \( x^2 - 9, x + 3 \)
7. \( x^2 - 3x - 10, x + 2 \)

8. Describe and correct the error in finding the sum.

\[
\frac{x}{x + 3} - \frac{2}{x - 1} = \frac{x - 2}{(x + 3)(x - 1)}
\]

In Exercises 9–12, find the sum or difference.

9. \( \frac{7}{2x^2} - \frac{4}{3x} \)
10. \( \frac{2}{x - 1} + \frac{4}{x + 2} \)
11. \( \frac{6}{x + 4} - \frac{5x}{x - 3} \)
12. \( \frac{14}{x^2 + 7x - 18} + \frac{6}{x + 9} \)

In Exercises 13 and 14, tell whether the statement is always, sometimes, or never true. Explain.

13. The LCD of two rational functions is the sum of the denominators.
14. The LCD of two rational functions is equal to one of the denominators.

In Exercises 15–18, rewrite the function \( g \) in the form \( g(x) = \frac{a}{x - h} + k \).

Graph the function. Describe the graph of \( g \) as a transformation of the graph of \( f(x) = \frac{a}{x} \).

15. \( g(x) = \frac{4x - 5}{x - 2} \)
16. \( g(x) = \frac{5x + 3}{x + 4} \)
17. \( g(x) = \frac{10x}{x - 3} \)
18. \( g(x) = \frac{3x + 4}{x} \)
7.5 Practice A

In Exercises 1–3, solve the equation by cross multiplying. Check your solution(s).

1. \( \frac{3}{4x} = \frac{1}{x - 2} \)
2. \( \frac{4}{x + 2} = \frac{6}{x - 2} \)
3. \( \frac{-3}{x + 1} = \frac{x - 5}{x - 5} \)

4. So far in baseball practice, you have pitched 47 strikes out of 61 pitches. Solve the equation \( \frac{80}{100} = \frac{47 + x}{61 + x} \) to find the number \( x \) of consecutive strikes you need to pitch to raise your strike percentage to 80%.

In Exercises 5 and 6, identify the least common denominator of the equation.

5. \( \frac{x}{x - 2} + \frac{2}{x} = \frac{5}{x} \)
6. \( \frac{3x}{x + 5} - \frac{8}{x} = \frac{2}{x} \)

In Exercises 7–12, solve the equation by using the LCD. Check your solution(s).

7. \( \frac{4}{3} + \frac{2}{x} = 4 \)
8. \( \frac{5}{2x} + \frac{1}{4} = \frac{9}{2x} \)
9. \( \frac{x - 2}{x - 3} + 3 = \frac{2x}{x} \)
10. \( \frac{4}{x - 5} + \frac{1}{x} = \frac{x - 1}{x - 5} \)
11. \( \frac{8}{x} + 3 = \frac{x + 8}{x - 4} \)
12. \( \frac{12}{x^2 - 2x} - \frac{3}{x - 2} = \frac{3}{x} \)

13. Describe and correct the error in the first step of solving the equation.

\[
\frac{4}{x} + \frac{1}{2} = 1
\]

\[
2x \cdot \frac{4}{x} + 2x \cdot \frac{1}{2} = 1
\]

14. You can clean the gutters of your house in 5 hours. Working together, you and your friend can clean the gutters in 3 hours. Let \( t \) be the time (in hours) your friend would take to clean the gutters when working alone. Write and solve an equation to find how long your friend would take to clean the gutters when working alone. 

(Hint: (Work done) = (Work rate) \times (Time))