

6.1 Introduction to Rational Functions and Equations

Recognizing and Using Rational Functions Solving Rational Equations Operations on Functions

Key Terms

Use the vocabulary terms listed below to complete the statements in exercises 1-3.

vertical asymptote**rational expression****extraneous solution**

1. A(n) _____ results when a polynomial is divided by a nonzero polynomial.
2. For the rational function $f(x) = \frac{2}{x-2}$, the line $x = 2$ is a(n) _____.
3. For the rational equation $\frac{x+2}{x-6} = \frac{8}{x-6}$, the number 6 is a(n) _____.

Recognizing and Using Rational Functions

Exercises 1-4: Determine whether each expression is rational.

1. $\frac{5+x}{3x^2-2}$

1. _____

2. $\frac{\sqrt{x}+2}{\sqrt{x}-4}$

2. _____

3. $\frac{-7}{x+4}$

3. _____

4. $\frac{(x+2)(x-3)}{x+1}$

4. _____

Exercises 5-8: Identify the domain of each function.

5. $f(x) = \frac{1}{x-3}$

5. _____

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

6. _____

7. $f(t) = \frac{4t}{t^2-5t+4}$

7. _____

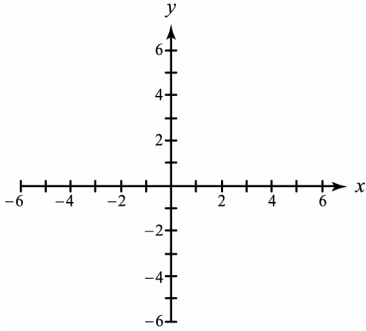
8. $f(b) = \frac{-5}{b^3+2b^2}$

8. _____

Exercises 9-12: For each rational function, state the domain and graph.

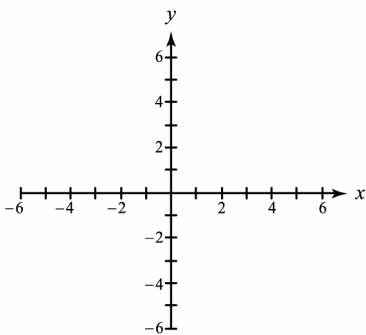
9. $f(x) = \frac{1}{2x}$

9. _____



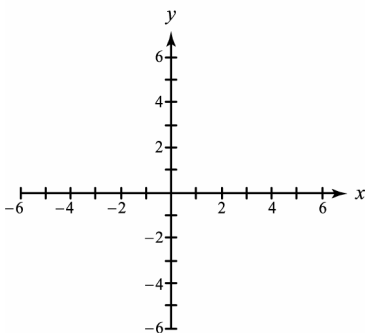
10. $f(x) = \frac{1}{x+3}$

10. _____



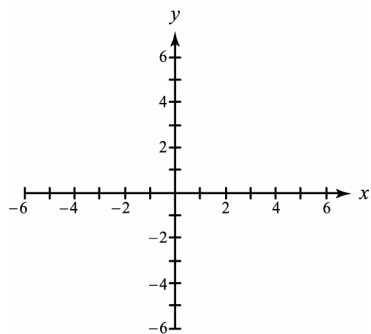
11. $f(x) = \frac{1}{x^2}$

11. _____



12. $f(x) = \frac{1}{x^2 - 4}$

12. _____



Exercises 13-16: Evaluate $f(x)$ at the given value of x .

13. $f(x) = \frac{1}{x+1}, x = -4$

13. _____

14. $f(x) = \frac{-2x}{x-5}, x = -5$

14. _____

15. $f(x) = \frac{2x+4}{3x-1}, x = 0$

15. _____

16. $f(x) = \frac{3}{x^2+3}, x = 3$

16. _____

17. When curves are designed for train tracks, sometimes the outer rail is elevated, or banked, so that a locomotive and its cars can safely negotiate the curve at a higher speed than if the tracks were level. Suppose that a circular curve with a radius of r feet is being designed for a train traveling 60 miles per hour. Then $f(r) = \frac{2540}{r}$ calculates the proper elevation y in inches for the outer rail, where $y = f(r)$. Evaluate $f(400)$ and interpret the result.

17. _____

Solving Rational Equations

18. Refer to exercise #17. Suppose that the outer rail for a track curve is elevated 8 inches. What should be the radius of the curve?

18. _____

Exercises 19-22: Solve each rational equation and check your answers.

19. $\frac{4x}{3x-1} = 2$

19. _____

20. $\frac{x-3}{x+2} = \frac{1}{x+2}$

20. _____

21. $\frac{x+3}{x-4} = \frac{7}{x-4}$

21. _____

22. $\frac{8}{x+2} = x$

22. _____

Operations on Functions

Exercises 23-26: Use $f(x) = 3x + 5$ and $g(x) = x^2$ to evaluate each of the following.

23. $(f + g)(-1)$ 23. _____

24. $(fg)(-3)$ 24. _____

25. $\left(\frac{f}{g}\right)(0)$ 25. _____

26. $(f/g)(-2)$ 26. _____

Exercises 27-30: Use $f(x) = 4x - 1$ and $g(x) = x + 7$ to evaluate each of the following.

27. $(f + g)(x)$ 27. _____

28. $(f - g)(x)$ 28. _____

29. $(fg)(x)$ 29. _____

30. $\left(\frac{f}{g}\right)(x)$ 30. _____