

7.2

Graphing Rational Functions

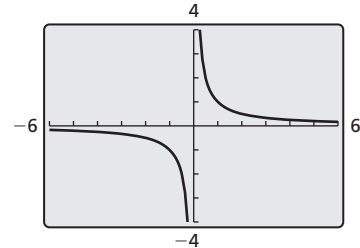
For use with Exploration 7.2

Essential Question What are some of the characteristics of the graph of a rational function?

The parent function for rational functions with a linear numerator and a linear denominator is

$$f(x) = \frac{1}{x} \quad \text{Parent function}$$

The graph of this function, shown at the right, is a *hyperbola*.



1 EXPLORATION: Identifying Graphs of Rational Functions

Work with a partner. Each function is a transformation of the graph of the parent function $f(x) = \frac{1}{x}$. Match the function with its graph. Explain your reasoning. Then describe the transformation.

a. $g(x) = \frac{1}{x - 1}$

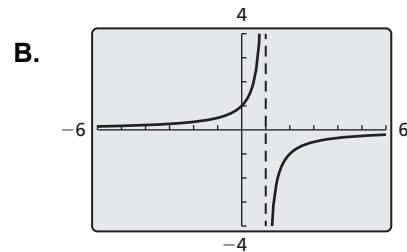
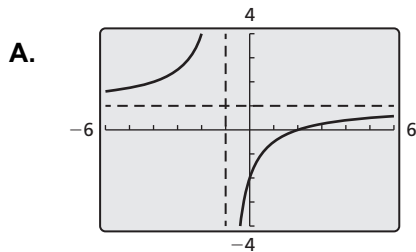
b. $g(x) = \frac{-1}{x - 1}$

c. $g(x) = \frac{x + 1}{x - 1}$

d. $g(x) = \frac{x - 2}{x + 1}$

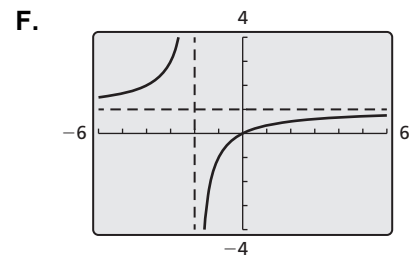
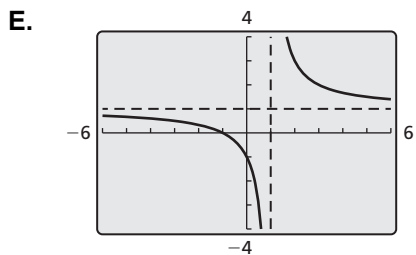
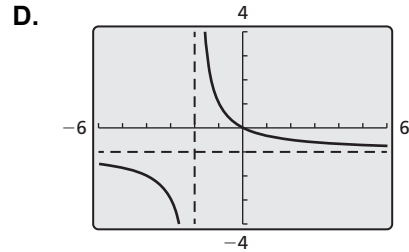
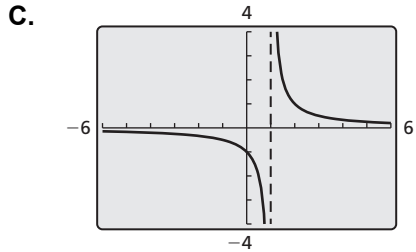
e. $g(x) = \frac{x}{x + 2}$

f. $g(x) = \frac{-x}{x + 2}$



7.2 Graphing Rational Functions (continued)

1 **EXPLORATION:** Identifying Graphs of Rational Functions (continued)



Communicate Your Answer

2. What are some of the characteristics of the graph of a rational function?

3. Determine the intercepts, asymptotes, domain, and range of the rational function

$$g(x) = \frac{x - a}{x - b}$$

7.2**Notetaking with Vocabulary**

For use after Lesson 7.2

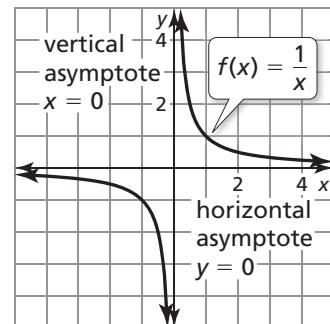
In your own words, write the meaning of each vocabulary term.

rational function

Core Concepts**Parent Function for Simple Rational Functions**

The graph of the parent function $f(x) = \frac{1}{x}$ is a *hyperbola*, which consists of two symmetrical parts called branches. The domain and range are all nonzero real numbers.

Any function of the form $g(x) = \frac{a}{x}$ ($a \neq 0$) has the same asymptotes, domain, and range as the function $f(x) = \frac{1}{x}$.

**Notes:**

7.2 Notetaking with Vocabulary (continued)

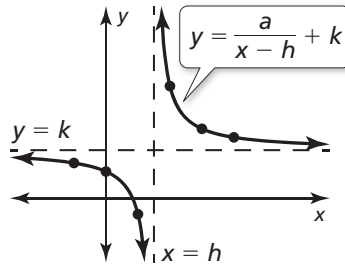
Graphing Translations of Simple Rational Functions

To graph a rational function of the form $y = \frac{a}{x - h} + k$, follow these steps:

Step 1 Draw the asymptotes $x = h$ and $y = k$.

Step 2 Plot points to the left and to the right of the vertical asymptote.

Step 3 Draw the two branches of the hyperbola so that they pass through the plotted points and approach the asymptotes.



Notes:

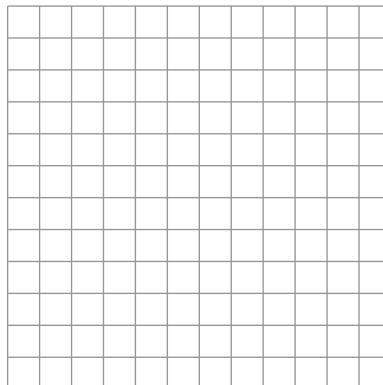
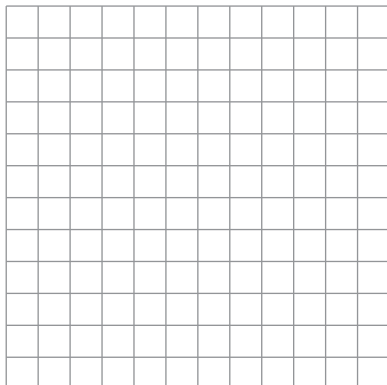
Extra Practice

In Exercises 1 and 2, graph the function. Compare the graph with the graph of

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

1. $g(x) = \frac{0.25}{x}$

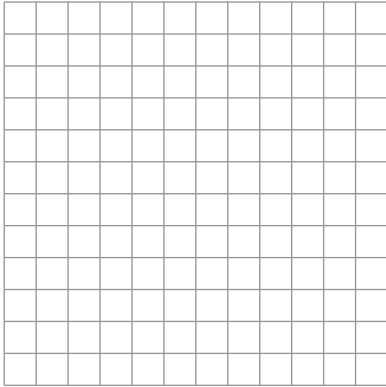
2. $h(x) = \frac{-2}{x}$



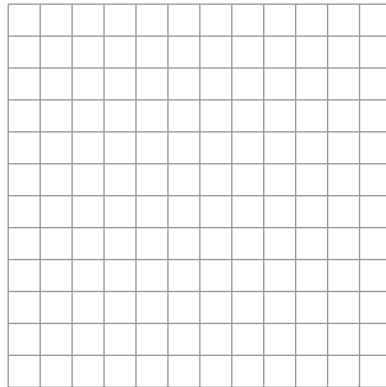
7.2 Notetaking with Vocabulary (continued)

In Exercises 3 and 4, graph the function. State the domain and range.

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



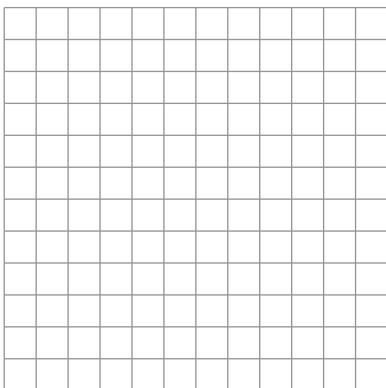
4. $m(x) = \frac{-3}{x} - 4$



In Exercises 5 and 6, 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

$f(x) = \frac{a}{x}.$

5. $g(x) = \frac{x+2}{x-5}$



6. $g(x) = \frac{2x+8}{3x-12}$

