

8.2 Graph Simple Rational Functions

TEKS 2A.10.A, 2A.10.B, 2A.10.C, 2A.10.F



Before

You graphed polynomial functions.

Now

You will graph rational functions.

Why?

So you can find average monthly costs, as in Ex. 38.

Key Vocabulary

- **rational function**
- **domain**, p. 72
- **range**, p. 72
- **asymptote**, p. 478

A **rational function** has the form $f(x) = \frac{p(x)}{q(x)}$ where $p(x)$ and $q(x)$ are polynomials and $q(x) \neq 0$. The inverse variation function $f(x) = \frac{a}{x}$ is a rational function. The graph of this function when $a = 1$ is shown below.

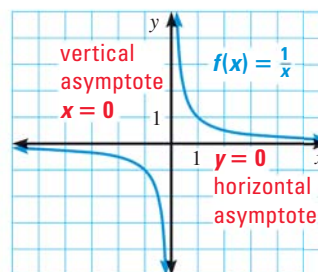
KEY CONCEPT

For Your Notebook

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



EXAMPLE 1 Graph a rational function of the form $y = \frac{a}{x}$

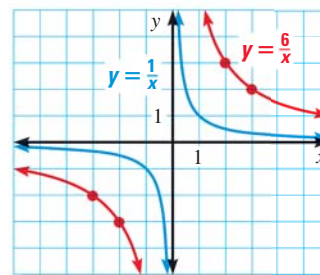
Graph the function $y = \frac{6}{x}$. Compare the graph with the graph of $y = \frac{1}{x}$.

Solution

STEP 1 Draw the asymptotes $x = 0$ and $y = 0$.

STEP 2 Plot points to the left and to the right of the vertical asymptote, such as $(-3, -2)$, $(-2, -3)$, $(2, 3)$, and $(3, 2)$.

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



The graph of $y = \frac{6}{x}$ lies farther from the axes than the graph of $y = \frac{1}{x}$.

Both graphs lie in the first and third quadrants and have the same asymptotes, domain, and range.

INTERPRET TRANSFORMATIONS

The graph of $y = \frac{6}{x}$ is a vertical stretch of the graph of $y = \frac{1}{x}$ by a factor of 6.