12.2 Graph Rational Functions

Before	You graphed inverse variation equations.
Now	You will graph rational functions.
Why?	So you can find the cost of a group trip, as in Ex. 39.

Key Vocabulary
- **rational function**
- **hyperbola,** *p. 767*
- **branches of a hyperbola,** *p. 767*
- **asymptotes of a hyperbola,** *p. 767*

The inverse variation equation $y = \frac{a}{x}$ ($a \neq 0$) is a type of *rational function*.

A **rational function** has a rule given by a fraction whose numerator and denominator are polynomials and whose denominator is not 0.


KEY CONCEPT   *For Your Notebook*

Parent Rational Function

The function $y = \frac{1}{x}$ is the parent function for any rational function whose numerator has degree 0 or 1 and whose denominator has degree 1. The function and its graph have the following characteristics:

- The domain and range are all nonzero real numbers.

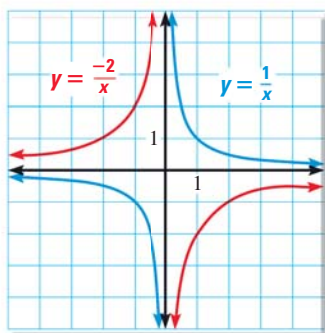- The horizontal asymptote is the *x*-axis. The vertical asymptote is the *y*-axis.
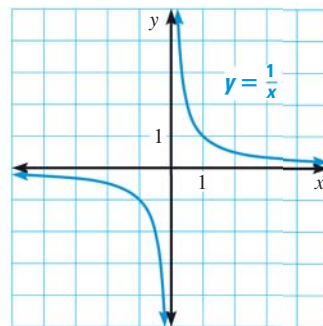
EXAMPLE 1   Compare graph of $y = \frac{a}{x}$ with graph of $y = \frac{1}{x}$

REWRITE FUNCTION

In the function $y = \frac{1}{3x}$, the value of a is $\frac{1}{3}$ as shown:

$y = \frac{1}{3x} = \frac{1}{3} \cdot \frac{1}{x}$

$= \dfrac{\frac{1}{3}}{x}$

a. The graph of $y = \frac{-2}{x}$ is a vertical stretch with a reflection in the *x*-axis of the graph of $y = \frac{1}{x}$.

b. The graph of $y = \frac{1}{3x}$ is a vertical shrink of the graph of $y = \frac{1}{x}$.