

## 7.4- Graphing Rational Functions

I can graph the parent function  $y = \frac{1}{x}$

I can use transformations to graph any reciprocal function.

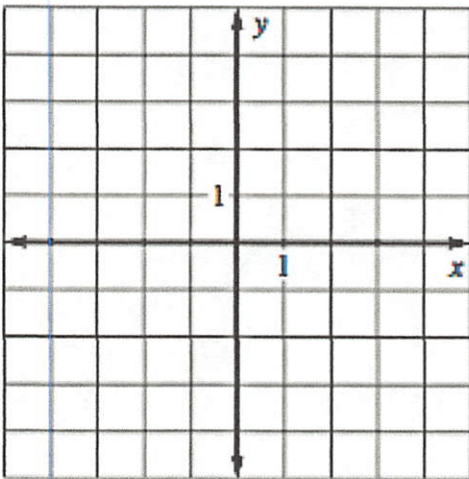
I can identify the vertical and horizontal asymptotes of a reciprocal function.

I can identify the domain and range of a reciprocal function

### Vocabulary:

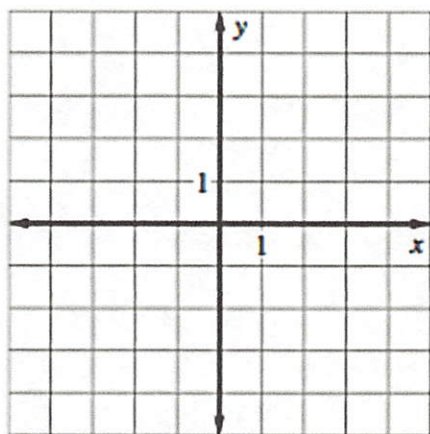
- Reciprocal function → a function that has an equation of the form \_\_\_\_\_, where  $a(x)$  is a \_\_\_\_\_ function and  $a(x)$  \_\_\_\_\_ zero
- Hyperbola → the name given to the graph of a \_\_\_\_\_ function
- Asymptote → a line that the \_\_\_\_\_ of a \_\_\_\_\_ approaches

Graph:  $y = \frac{1}{x}$

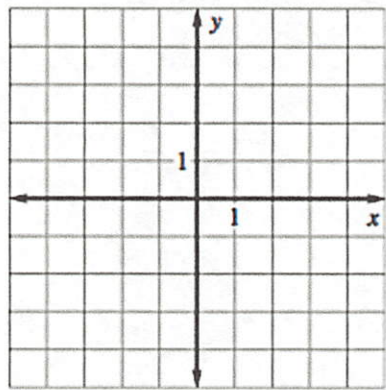


### PARENT FUNCTION FOR SIMPLE RATIONAL FUNCTIONS

- The graph of the parent function  $f(x) = \frac{1}{x}$  is a \_\_\_\_\_, which consists of two symmetrical parts called \_\_\_\_\_.
- The domain and range are \_\_\_\_\_.
- The asymptotes are  $x = \underline{\hspace{1cm}}$ , and  $y = \underline{\hspace{1cm}}$ .
- Any function of the form  $g(x) = \frac{a}{x}$  ( $a \neq 0$ ) has the same \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ as the function  $f(x) = \frac{1}{x}$ .

**Example 1****Graph a rational function of the form  $y = \frac{a}{x}$** **Graph the function  $y = \frac{4}{x}$ .****1. Draw the asymptotes  $x = \underline{\hspace{2cm}}$  and  $y = \underline{\hspace{2cm}}$ .****2. Plot points to the left and to the right of the vertical asymptote, such as  $(-2, \underline{\hspace{2cm}})$ ,  $(-1, \underline{\hspace{2cm}})$ ,  $(1, \underline{\hspace{2cm}})$ , and  $(2, \underline{\hspace{2cm}})$ .****3. Draw the branches of the hyperbola so that they pass through the plotted points and approach the asymptotes.****✔ Checkpoint Graph the function.**

**1.  $y = \frac{3}{x}$**

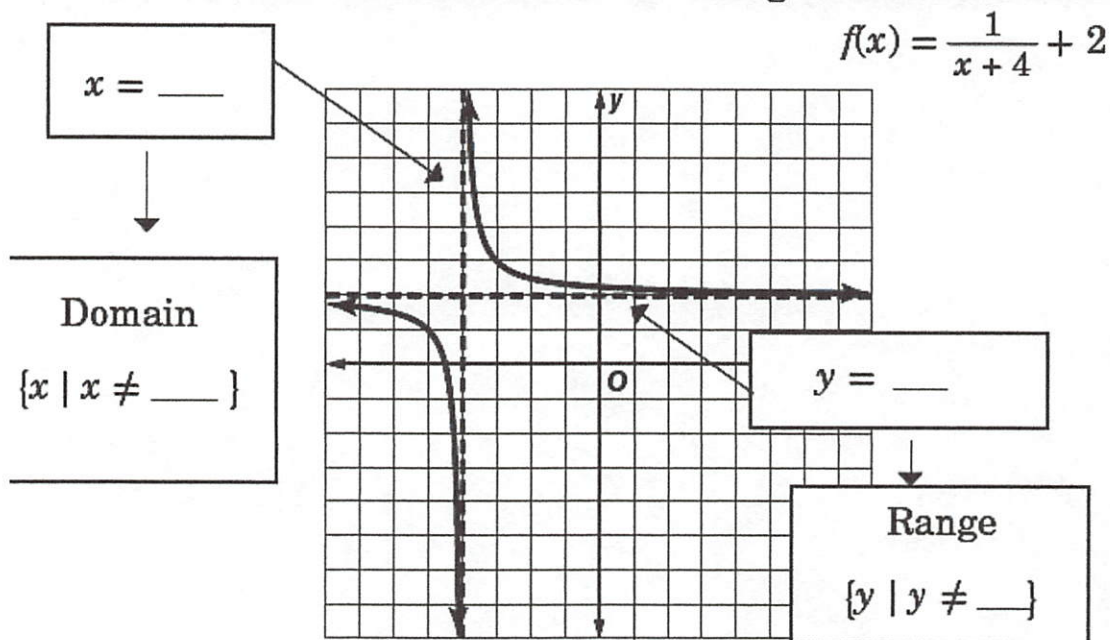
**GRAPHING TRANSLATIONS OF SIMPLE RATIONAL FUNCTIONS**

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

**Step 1 Draw the asymptotes  $x = \underline{\hspace{2cm}}$  and  $y = \underline{\hspace{2cm}}$ .****Step 2 Plot points to the left and to the right of the  $\underline{\hspace{4cm}}$ .****Step 3 Draw the two  $\underline{\hspace{4cm}}$  of the hyperbola so that they pass through the plotted points and approach the asymptotes.**

## Vertical and Horizontal Asymptotes:

Sketch the vertical and horizontal asymptotes in the graph below. Write the equations of the asymptotes and then write the domain and range for the function.



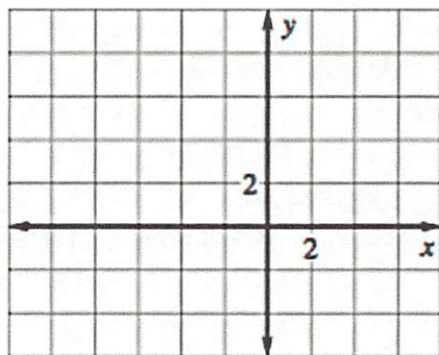
### Example 2

Graph a rational function  $y = \frac{a}{x-h} + k$

Graph  $y = \frac{-6}{x+3} + 2$ . State the domain and range.

1. Draw the asymptotes  $x = \underline{\hspace{2cm}}$   
and  $y = \underline{\hspace{2cm}}$ .

2. Plot points to the left and to the right of the vertical asymptote, such as  $(-6, \underline{\hspace{1cm}})$ ,  $(-4, \underline{\hspace{1cm}})$ ,  $(-2, \underline{\hspace{1cm}})$ , and  $(0, \underline{\hspace{1cm}})$ .



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

The domain is  $\underline{\hspace{4cm}}$ , and the range is  $\underline{\hspace{4cm}}$ .

Transformations of Reciprocal Functions:

Compare and contrast the graphs of  $f(x) = \frac{1}{x}$  to  $g(x) = \frac{3}{x-2} - 5$  for each of the listed characteristics.

	Domain	Range	Vertical Asymptotes	Horizontal Asymptotes
$f(x)$				
$g(x)$				

✔ **Checkpoint** Graph the function. State the domain and range.

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

