

Algebra 2

8.3

Quiz 8.1-8.2 Mon.

Determine properties of reciprocal functions

Graph transformations of reciprocal functions

continuous

*discontinuous

parent graph

reciprocal function

hyperbola

asymptote

domain

range

$$x \rightarrow \frac{1}{x}$$

$$\frac{1}{3} \rightarrow \frac{3}{1}$$

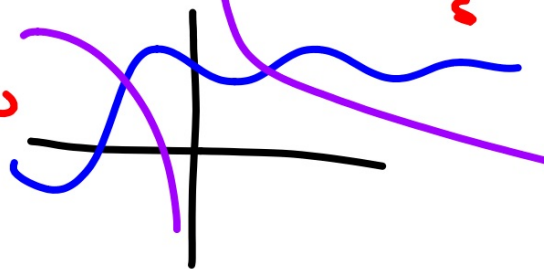
$$x \neq 0$$

$$-5 \rightarrow -\frac{1}{5}$$

$$x = 0$$

$$x \neq 0$$

$$y \neq 0$$



Is it ever OK to divide by zero?

whiteboards

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

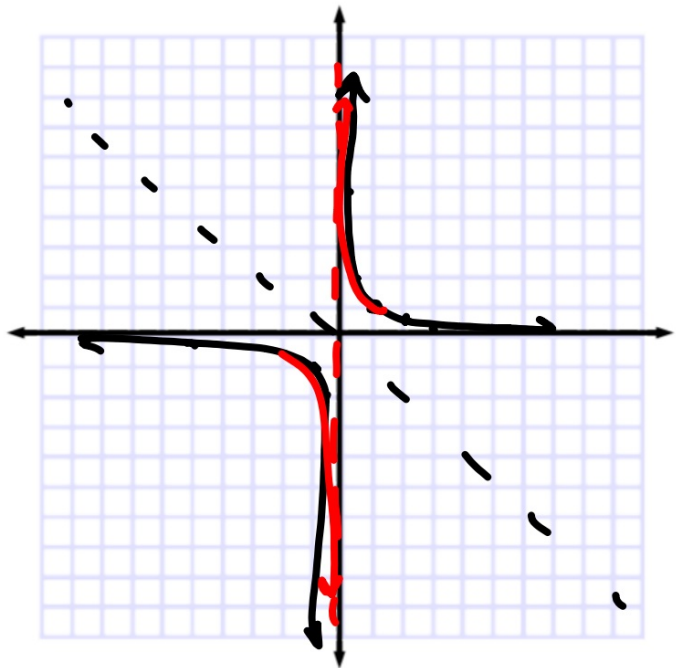
Graph $y = 1/x$ using TOV

1	1	1
2	$\frac{1}{2}$	0.5
3	$\frac{1}{3}$	

Are there any value(s) that can't be used?

$\frac{1}{2}$	2
1	5
5	1
1	1
-2	-1
-5	-2
$-\frac{1}{2}$	-5
	-1
	2
	5

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



KeyConcept Parent Function of Reciprocal Functions

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

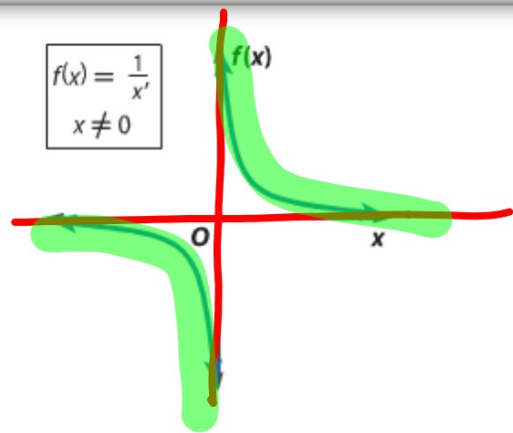
Type of graph: **hyperbola**

Domain and range: all nonzero real numbers

Asymptotes: $x = 0$ and $f(x) = 0$

Intercepts: none

Not defined: $x = 0$



Parent graph: VA = $x = 0$ HA = $y = 0$

(can't divide by 0)

The domain of a reciprocal function is limited to values for which the function is defined.

Functions

$$f(x) = \frac{-3}{x+2}$$

$$g(x) = \frac{4}{x-5}$$

$$h(x) = \frac{3}{x}$$

Not defined at: $x = -2$

$x = 5$

$x = 0$

$$\begin{aligned}x + 2 &= 0 \\ -2 & -2 \\ \hline x &= -2\end{aligned}$$

$$\begin{aligned}x - 5 &= 0 \\ x &= 5\end{aligned}$$

Translation (L-R) changes VA
(just like all other parent graphs)

Guided Practice

Determine the value of x for which each function is not defined.

1A. $f(x) = \frac{2}{\underbrace{x-1}}$

$$x-1=0$$

$$x=1$$

1B. $f(x) = \frac{7}{\underbrace{3x+2}}$

$$3x+2=0$$

$$3x=-2$$

$$x=-\frac{2}{3}$$

What would make the denom = 0?
Can't be used (domain)

Example 1 Limitations on Domain

Determine the value of x for which $f(x) = \frac{3}{2x + 5}$ is not defined.

VA = where is it undefined?
 HA = end behavior (y=0 unless...)
 Compare to parent graph...

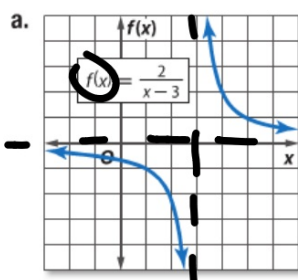
StudyTip

CCSS Structure Vertical asymptotes show where a function is undefined, while horizontal asymptotes show the end behavior of a graph.

Example 2 Determine Properties of Reciprocal Functions



Identify the asymptotes, domain, and range of each function.



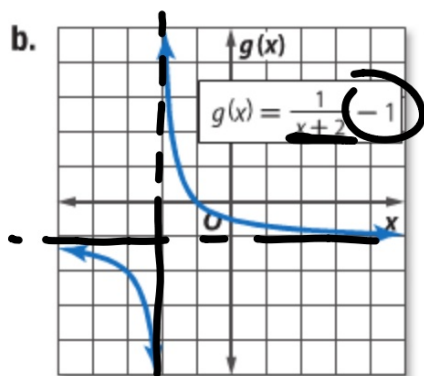
$$y = \frac{2}{x-3} \quad \text{VA } x=3$$

$$\text{HA } y=0$$

$$D = \text{ARN } x \neq 3$$

$$R = \text{ARN } y \neq 0$$

Use equation (if given) and graph



Compare to parent graph & equation
(Don't go by eyeball)

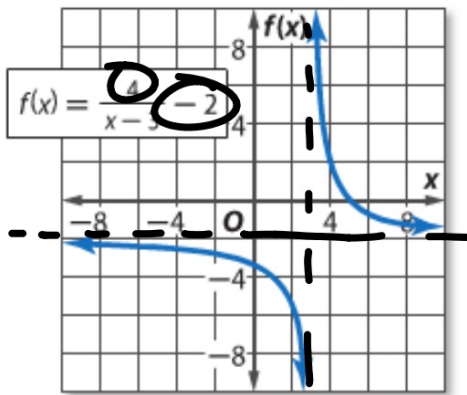
VA $x = -2$

HA $y = -1$

$$VA = x = 3$$

Guided Practice HA $y = -2$

2A.



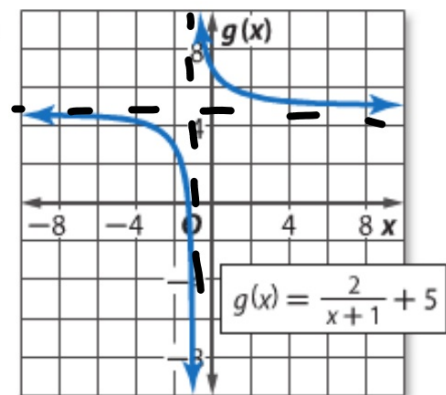
D: $\mathbb{R} \setminus \{3\}$

R: $\mathbb{R} \setminus \{-2\}$

$$VA$$

$$HA$$

2B.



StudyTip

Asymptotes The asymptotes of a reciprocal function move with the graph of the function and intersect at (h, k) .

KeyConcept Transformations of Reciprocal Functions

$$f(x) = \frac{a}{x-h} + k$$

h – Horizontal Translation

h units right if h is positive
 $|h|$ units left if h is negative

The *vertical* asymptote is at $x = h$.

k – Vertical Translation

k units up if k is positive
 $|k|$ units down if k is negative

The *horizontal* asymptote is at $f(x) = k$.

a – Orientation and Shape

If $a < 0$, the graph is reflected across the x -axis.

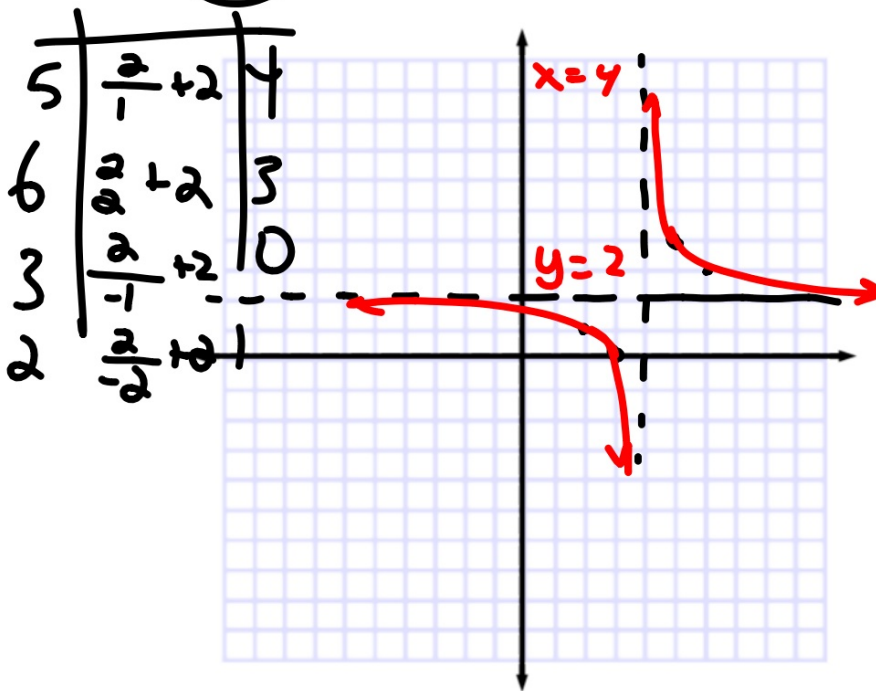
If $|a| > 1$, the graph is stretched vertically.
If $0 < |a| < 1$, the graph is compressed vertically.

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Example 3 Graph Transformations

Graph each function. State the domain and range.

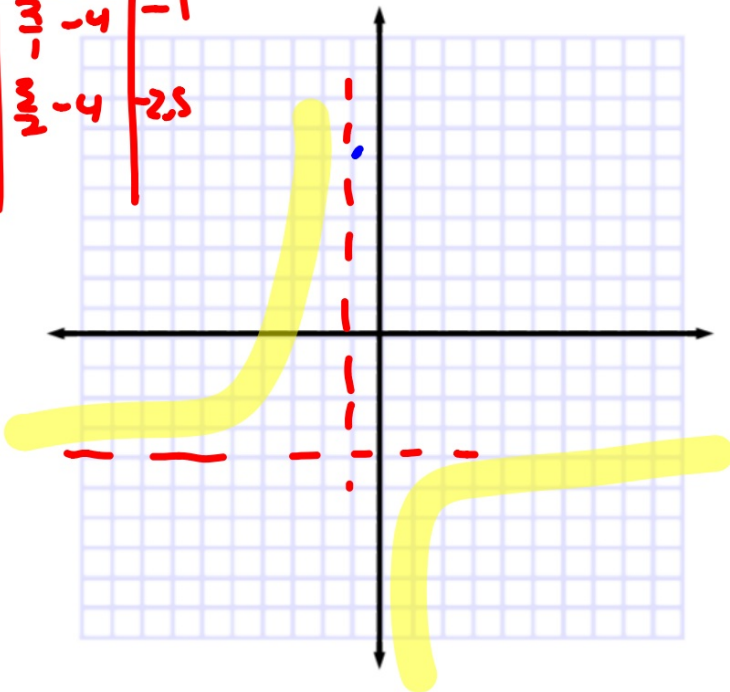
a. $f(x) = \frac{2}{x-4} - 2$



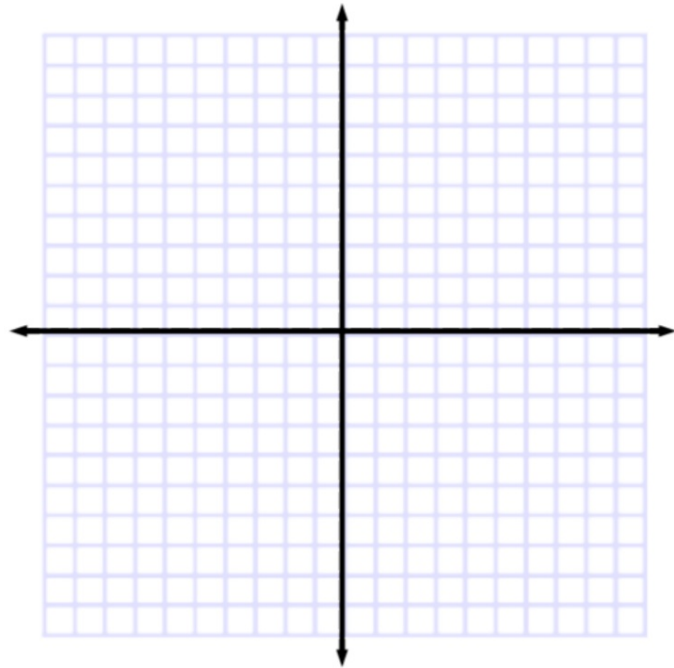
parent graph
 VA
 HA
 reflection (maybe?)
 find a few ord prs to locate
 the "quadrants"

b. $f(x) = \frac{-3}{x+1} - 4$

0	$\frac{3}{1}$	-4	-1
1	$\frac{3}{2}$	-4	-2.5

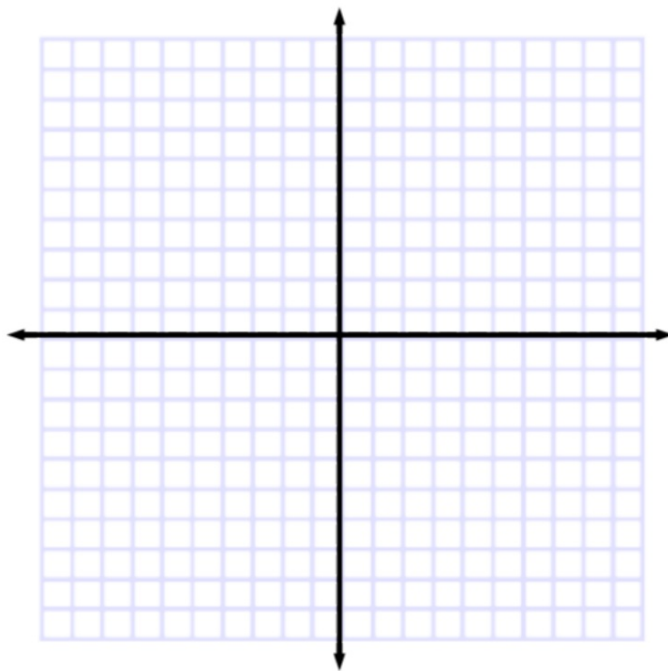


b. $f(x) = \frac{-3}{x+1} - 4$

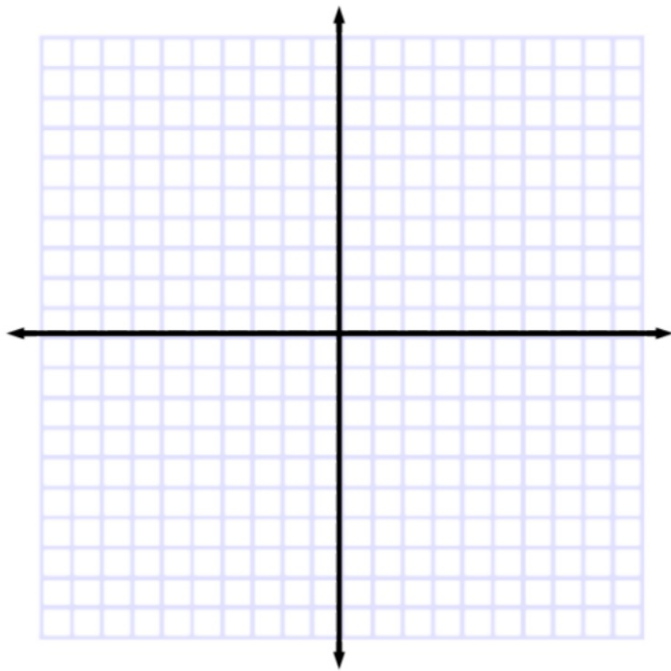


Guided Practice

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



3B. $g(x) = \frac{1}{3(x-1)} - 2$



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