

Algebra 2 8.3

Determine properties of reciprocal functions

Graph transformations of reciprocal functions

continuous

discontinuous

parent graph

reciprocal function

hyperbola

asymptote

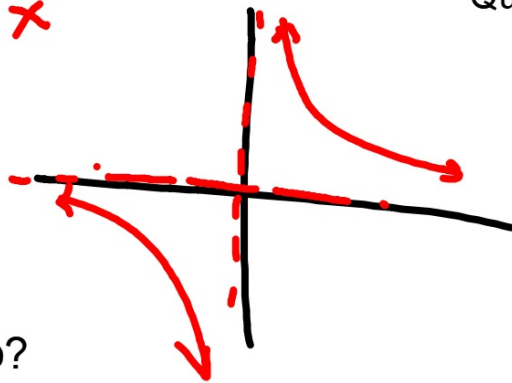
domain

range

Is it ever OK to divide by zero?

whiteboards

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



Quiz 8.1-8.2

$$9. \frac{a^2 - b^2}{3a^2 - 6a + 3} \cdot \frac{a^2 - 1}{4a + 4b} \quad \frac{(a-b)(a+1)}{12(a-1)}$$

$$\frac{(a+b)(a-b)}{3(a-1)(a+1)} \cdot \frac{(a+1)(a-1)}{4(a+b)}$$

$$51. \frac{4x^2 - 1}{3x^3 - 6x^2 - 24x} \cdot \frac{-2x^2 + 5x + 12}{12x^2 + 12x - 9}$$

$\frac{(2x+1)(2x-1)}{3x(x^2-2x-8)} \cdot \frac{(x-4)(-2x-3)}{3(4x^2+4x-3)}$

$\frac{-1(2x+1)}{9(x+2)}$

$\frac{-24}{1 \ 24}$
 $\frac{2 \ 12}{-3+8}$
 $(-2x-3)(x+12)$
 $x(-2x-3)-4(-2x-3)$
 $\frac{-12}{1 \ 12}$
 $\frac{-2+6}{3 \ 4}$
 $(4x^2-2x)+6x-3$
 $2x(2x-1)+3(2x)$

$$\textcircled{10} \quad \frac{8y-9}{y-3} + \frac{2y-5}{y^2-12y+27} \quad \begin{matrix} -9 & \times & -3 \\ \hline 27 & & \end{matrix}$$

$$\frac{10y-77}{(y-9)(y-3)}$$

$$\frac{8y-72}{(y-3)(y-9)} + \frac{2y-5}{(y-9)(y-3)}$$

KeyConcept Parent Function of Reciprocal Functions

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

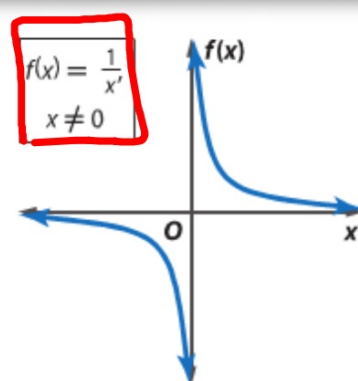
Type of graph: **hyperbola**

Domain and range: all nonzero real numbers

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

Intercepts: none

Not defined: $x = 0$



Guided Practice

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

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

$$x - 1 = 0$$

$$x = 1$$

$$x \neq 1$$

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

$$3x + 2 = 0$$

$$3x = -2$$

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

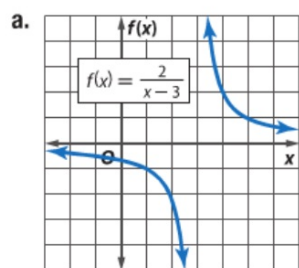
$$x \neq -\frac{2}{3}$$

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.



$$VA \ x = 3$$

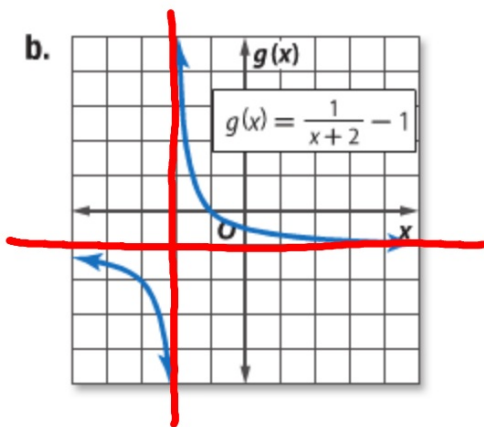
$$HA \ y = 0$$

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

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

$$\begin{aligned} x-3 &= 0 \\ x &= 3 \end{aligned}$$

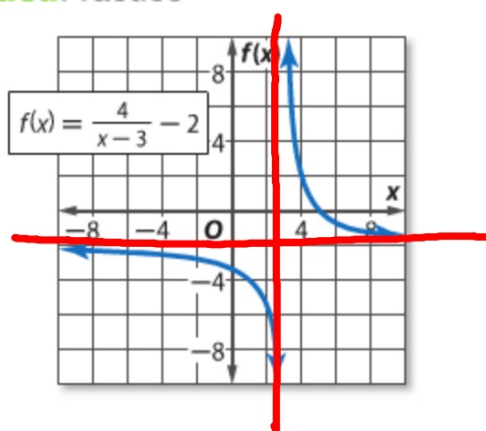
b.



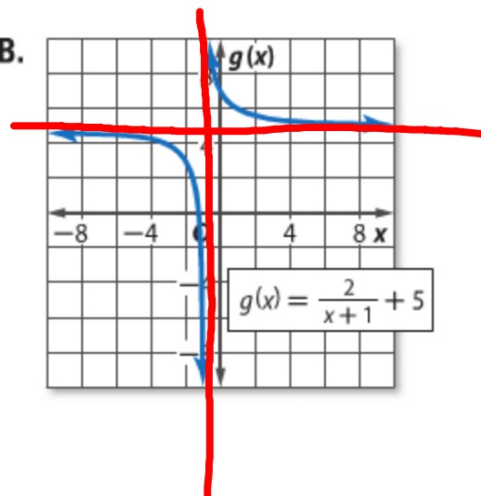
$$\begin{aligned} VA & \quad x+2=0 \\ & \quad x=-2 \\ HA & \quad y=-1 \end{aligned}$$

Guided Practice

2A.



2B.



P. 547

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.

Whiteboards

Example 3 Graph Transformations

Graph each function. State the domain and range.

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

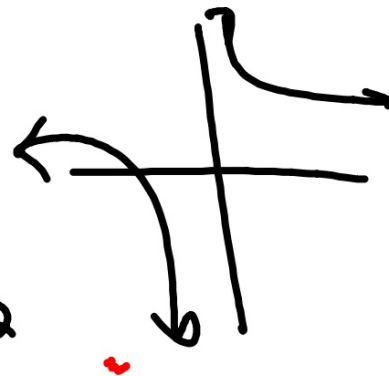
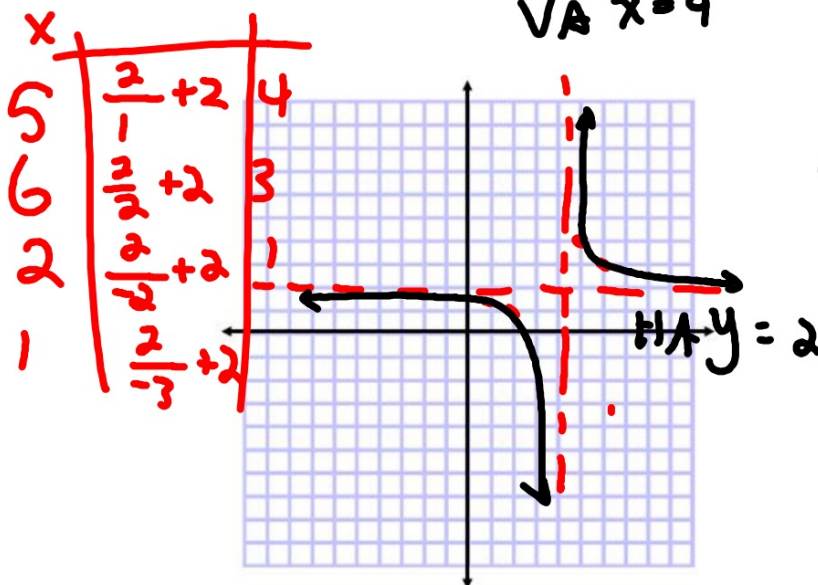
D A R N' X & Y

VA $x=4$

What happened to the parent graph?

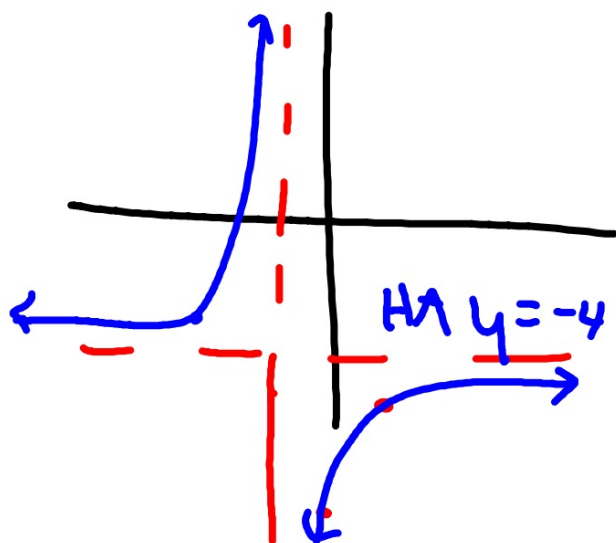
Use transformation(s)

Can use a couple of ordered pairs. But if you use a whole bunch...



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

VA
 $x = -1$



x			
2	$\frac{-3}{3}$	-4	-5
0	$\frac{-3}{1}$	-4	-7
-4	$\frac{-3}{-5}$	-4	-3

Guided Practice

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

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

