Lesson 8.2 The Reciprocal Function Family (Clickers)

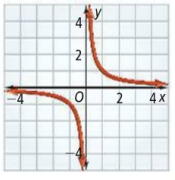
Essential Understanding: Transformations of the parent reciprocal function include stretches, compressions (or shrinks), reflections, and horizontal and vertical translations.

Key Concept General Form of the Reciprocal Function Family

The general form of a member of the reciprocal function family is $y = \frac{a}{x - h} + k$, where $x \neq h$.

The inverse variation functions, $y = \frac{a}{x}$, are stretches, shrinks, and reflections of the parent reciprocal function, depending on the value of a.

The graph of the parent reciprocal function $y = \frac{1}{x}$ is shown at the right.



Ex. What is the graph of y = 8/x , x ≠ 0? Identify the x- and y-intercepts and the asymptotes of the graph. Also, state the domain and range.

x-intercepts:

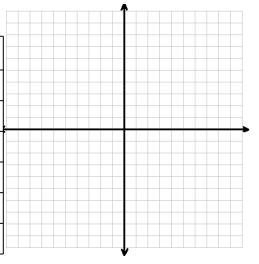
y-intercepts:

asymptotes:

domain:

range:

x	y



Ex. What is the graph of y = -6/x , x ≠ 0? Identify the x- and y-intercepts and the asymptotes of the graph. Also, state the domain and range.

x-intercepts:

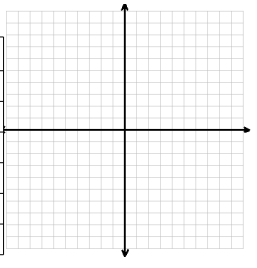
y-intercepts:

asymptotes:

domain:

range:

x	y



1 Would the function y = 6/x have the same domain and range as y = 8/x or y = 12/x?

Yes

No

Each part of the graph of a reciprocal function is a branch. The branches of the parent function y = 1/x are in Quadrants I and III. Stretches and compressions of the parent function remain in the same quadrants. Reflections are in Quadrants II and IV.

Ex. How does y = 8/x compare to the graph of y = 1/x?

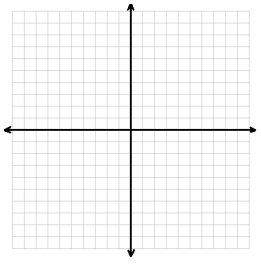
Ex. How does y = -0.25/x compare to the graph of y = 1/x?

The following is review of the different transformations on graphs that can be applied to reciprocal functions.

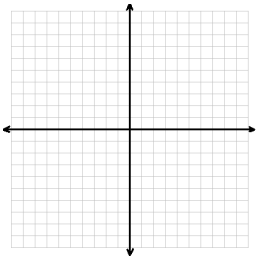
Key Concept The Reciprocal Function Family

Parent function	$y = \frac{1}{x}, x \neq 0$
Stretch ($\lvert a \rvert > 1$) Shrink ($0 < \lvert a \rvert < 1$) Reflection ($a < 0$) across x-axis	$y = \frac{a}{x}, x \neq 0$
Translation (horizontal by h; vertical by k) with vertical asymptote $x = h$ horizontal asymptote $y = k$	$y = \frac{1}{x - h} + k; x \neq h$
Combined	$y = \frac{a}{x - h} + k; x \neq h$

Ex. What is the graph of $y = \frac{1}{x + 1} - 2$? Identify the domain and range. (hint: identify the asymptote(s) first)



Ex. What is the graph of $y = \frac{1}{x - 4} + 6$? Identify the domain and range. (hint: identify the asymptote(s) first)



If you know the asymptotes of the graph of a reciprocal function and the value of a, you can write the equation of the function.

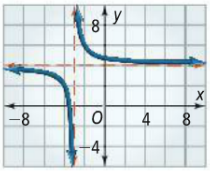
Multiple Choice This graph of a function is a translation of the graph of $y = \frac{2}{x}$. What is an equation for the function?

(A) $y = \frac{2}{x+3} + 4$

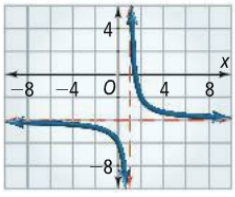
(C) $y = \frac{2}{x-3} + 4$

(B) $y = \frac{2}{x+3} - 4$

(D) $y = \frac{2}{x-3} - 4$



2 This graph of a function is a translation of the graph of y = 2/x. What is an equation for the function?



Ex. The rowing club is renting a 57-passenger bus for a day trip. The cost of the bus is $750. Five passengers will be chaperones. If the students who attend share the bus cost equally, what function models the cost per student C with respect to the number of students n who attend? What is the domain of the function? How many students must ride the bus to make the cost per student no more than $20?