

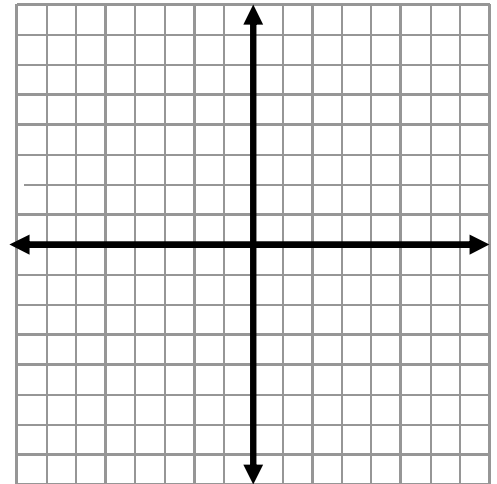
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Graph $y = \frac{1}{x}$. Write the equations of any asymptotes, and state the domain and the range.

Domain: _____

Range: _____

Asymptote: _____



Functions that model inverse variation have the form $f(x) = \frac{a}{x}$, where $x \neq 0$. They belong to a family whose parent is the **reciprocal function** $f(x) = \frac{1}{x}$, where $x \neq 0$.

Take note

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 $x \neq h$.

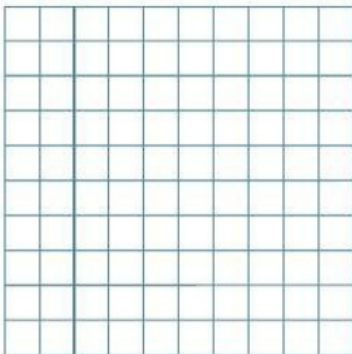
An **asymptote** is a line that a graph approaches as x or y increases in absolute value. The x - and y -axes are asymptotes of the parent reciprocal function.

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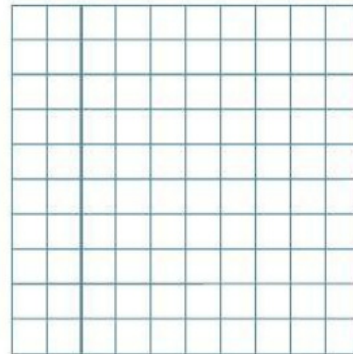
Problem 1 Graphing an Inverse Variation Function

A Practice Graph each function. Identify the x - and y -intercepts and the asymptotes of the graph. Also, state the domain and the range of the function.

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



2. $y = \frac{10}{x}$

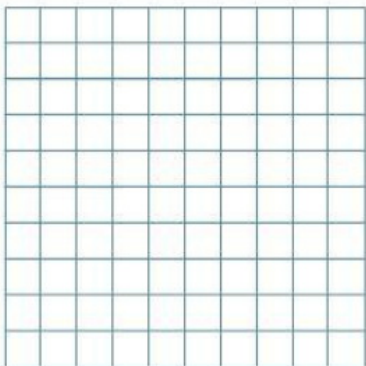


Each part of the graph of a reciprocal function is a **branch**. The branches of the parent function $y = \frac{1}{x}$ are in Quadrants I and III. Stretches and compressions of the parent function remain in the same quadrants. Reflections are in Quadrants II and IV.

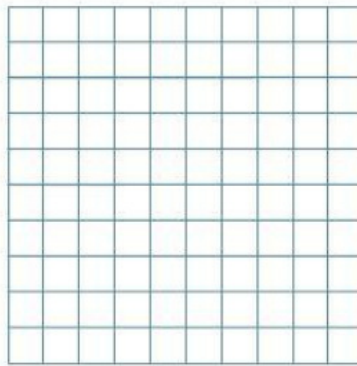
Problem 2 Identifying Reciprocal Function Transformations

A Practice Graphing Calculator Graph the equations $y = \frac{1}{x}$ and $y = \frac{a}{x}$ using the given value of a . Then identify the effect of a on the graph.

3. $a = -4$



4. $a = 0.75$



You can translate any reciprocal function horizontally or vertically just as you can other functions.

Take note

Key Concept The Reciprocal Function Family

Parent function

$$y = \frac{1}{x}, x \neq 0$$

Stretch ($|a| > 1$)

Shrink ($0 < |a| < 1$)

Reflection ($a < 0$) across x -axis

$$y = \frac{a}{x}, x \neq 0$$

Translation (horizontal by h ; vertical by k)
with vertical asymptote $x = h$, and
horizontal asymptote $y = k$

$$y = \frac{1}{x-h} + k; x \neq h$$

Combined

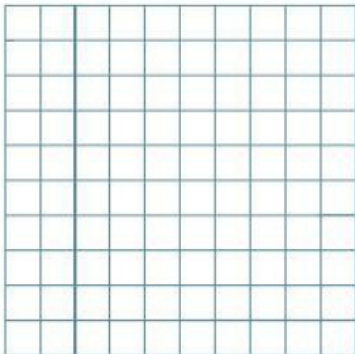
$$y = \frac{a}{x-h} + k; x \neq h$$

When you graph a translated reciprocal function, a good first step is to draw the asymptotes.

Problem 3 Graphing a Translation

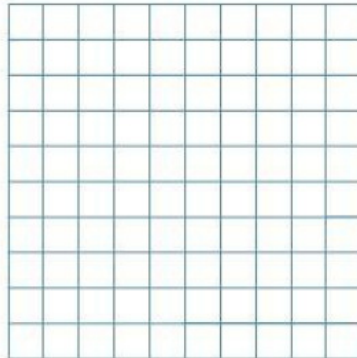
A Practice Sketch the asymptotes and the graph of each function. Identify the domain and range.

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



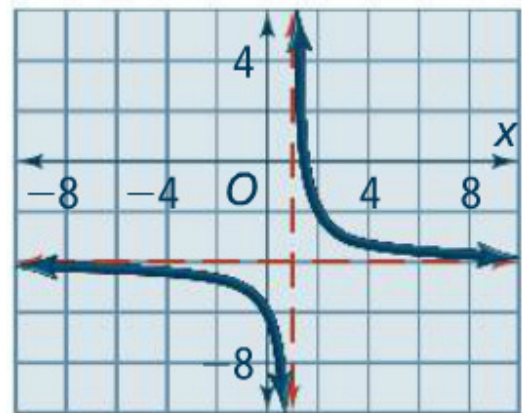
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6. $y = \frac{-8}{x+5} - 6$



Problem 4 Writing the Equation of a Transformation

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



A Practice Write an equation for the translation of $y = \frac{2}{x}$ that has the given asymptotes.

7. $x = 0$ and $y = 4$

8. $x = 4$ and $y = -8$

Problem 5 Using a Reciprocal Function

- A Practice** 9. **Construction** The weight P in pounds that a beam can safely carry is inversely proportional to the distance D in feet between the supports of the beam. For a certain type of wooden beam, $P = \frac{9200}{D}$. What distance between supports is needed to carry 1200 lb?
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