



Concepts

The Reciprocal Function

Based on power point presentations by Pearson Education, Inc.
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Learning Objectives

1. Memorize the definition of the reciprocal function.
2. Memorize characteristics of the graph of the reciprocal function.
3. Apply transformations to the reciprocal function.
4. Graph the reciprocal function and its transformations by hand.

1. Definition of the Reciprocal Function

A rational function showing up often in mathematics is called the *Reciprocal Function*. Sometimes it is called the *common* or *basic* rational function.

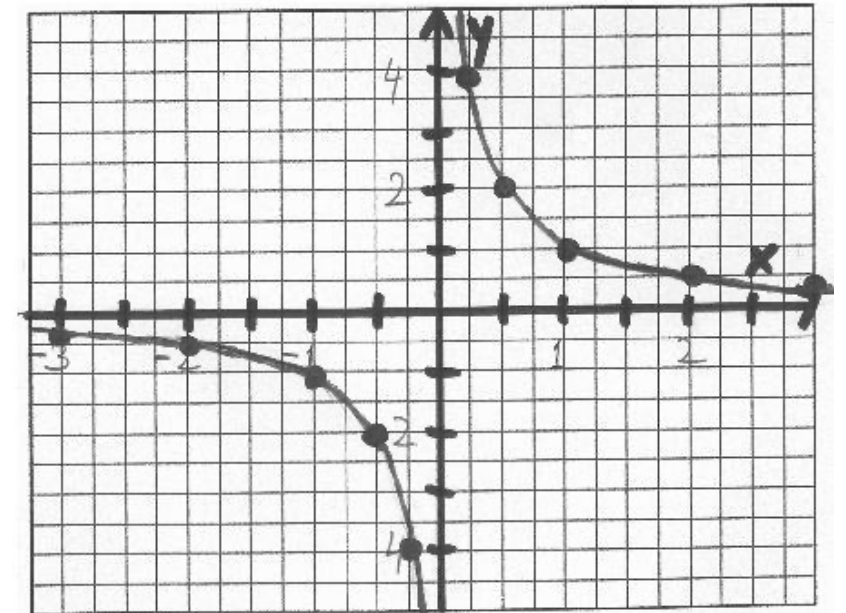
$$f(x) = \frac{1}{x}$$

Domain: $(-\infty, 0) \cup (0, \infty)$ or $\{x \mid x \neq 0\}$

Range: $(-\infty, 0) \cup (0, \infty)$ or $\{y \mid y \neq 0\}$

Basic Characteristics of the Graph:

- The y -axis is the vertical asymptote. The graph gets closer and closer to it but never touches it.
- The x -axis is the horizontal asymptote. The graph gets closer and closer to it but never touches it.
- There are no x - and y -intercepts.



2. Transformations of the Graph of the Reciprocal Function

Transformations* of the reciprocal function $f(x) = \frac{1}{x}$ have the same type of graph, however, it can lie anywhere in the coordinate system (depending on the transformation).

The domains of transformations of the reciprocal function consist of *all real numbers except those that make the denominator equal to 0*.

*Remember, that transformations may consist of vertical shifts, horizontal shifts, stretching, condensing, reflections across the x- and y-axis, etc.

Horizontal shifts WILL affect the location of the vertical asymptote.
Vertical shifts WILL affect the location of the horizontal asymptote!

3. Graph the Reciprocal Function and its Transformations by Hand

1. Find the equation of the vertical asymptote. Use a dashed line to graph it unless it is the y -axis.
2. Find the equation of the horizontal asymptote. Use a dashed line to graph it unless it is the x -axis.
3. Find the point associated with the y -intercept, if it exists. There is at most one.
4. Find any points associated with the x -intercept(s), if they exist.
5. Find additional points. Best is to find at least three points to either side of the vertical asymptote.
6. Use the information obtained in the steps above to graph the function keeping in mind the shape of the graph of a reciprocal function.