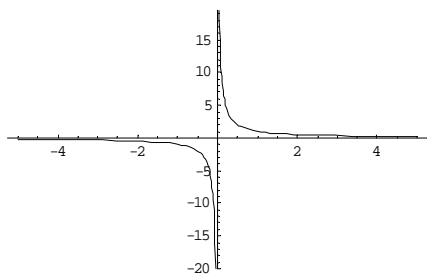




Transformations of the Basic Rational Functions $y = \frac{1}{x}$



- Domain: $(-\infty, 0) \cup (0, \infty)$
- Range: $(-\infty, 0) \cup (0, \infty)$
- Horizontal asymptote: $y = 0$
- Vertical asymptote: $x = 0$
- Behavior near vertical asymptote: As $x \rightarrow 0^-$, $y \rightarrow -\infty$. As $x \rightarrow 0^+$, $y \rightarrow \infty$.

Exercises. (1) Identify the appropriate transformation of the basic rational function, $y = \frac{1}{x}$. (2) Identify all horizontal and vertical asymptotes and (3) Identify the domain and range of the function.

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

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

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

4. $y = \frac{4}{x-1} + 3$

5. $y = -\frac{3}{x+1} - 4$

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

7. $y = \frac{6}{x} - 3$

8. $y = \frac{4x-3}{x}$

9. $y = \frac{2x+1}{x-3}$

10. An airline has a daily nonstop flight between Los Angeles, California, and Sydney, Australia. A one-way trip is about 7500 miles.

a) Write an equation to represent the travel time from Los Angeles to Sydney as a function of flight speed.

b) Explain any limitations to the range or domain in this situation.

11. Parker has 200 grams of an unknown liquid. Knowing the density will help him discover what type of liquid this is.

a) Density of a liquid is found by dividing the mass by the volume. Write an equation to represent the density of this unknown as a function of volume.

b) Identify the asymptotes, domain and range of the function.

12. A company uses the formula $S(x) = \frac{45x+25}{x+1}$ to determine the salary in thousands of dollars of an employee during his x th year.

a) What domain and range values are meaningful in the context of the problem?

b) What is the meaning of the horizontal asymptote for the graph?