

Notes: Intro to Rational Functions

What does it mean for a function to be undefined?

Identify the value of x that makes the function undefined.

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

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

3. $f(x) = \frac{1}{12-x}$

4. $f(x) = -\frac{6}{5+x}$

How did you determine the values of x that made the function undefined?

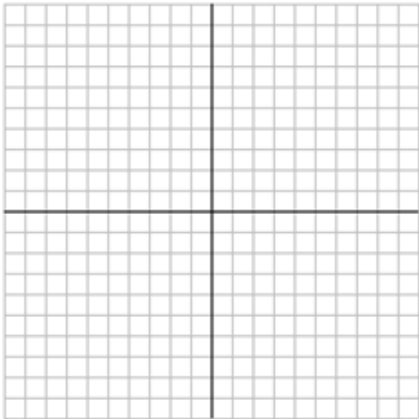
Vocabulary

Rational Function –

Horizontal Asymptote –

Vertical Asymptote –

Explore: 1. Graph the function $f(x) = \frac{1}{x}$.



a) Is the graph of $f(x) = \frac{1}{x}$ a continuous graph? Explain.

b) Does the graph of $f(x) = \frac{1}{x}$ intersect the x-axis? Explain.

c) Does the graph of $f(x) = \frac{1}{x}$ intersect the y-axis? Explain.

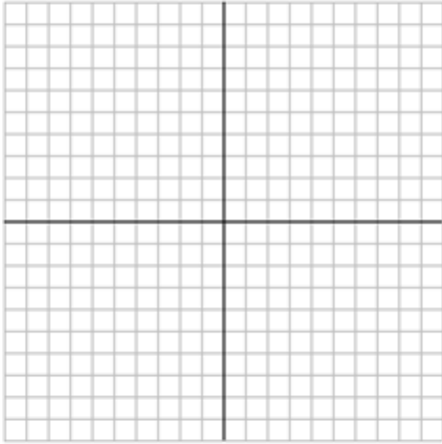
d) Is the graph of $f(x) = \frac{1}{x}$ a function? Explain.

e) As $x \rightarrow -\infty$, what happens to the y-values?

f) As $x \rightarrow \infty$, what happens to the y-values?

g) State the domain and range of the function using all three representations.

2. Graph the function $g(x) = \frac{1}{x^2}$.



- Is the graph of $f(x) = \frac{1}{x}$ a continuous graph? Explain.
- Does the graph of $f(x) = \frac{1}{x}$ intersect the x-axis? Explain.
- Does the graph of $f(x) = \frac{1}{x}$ intersect the y-axis? Explain.
- Is the graph of $f(x) = \frac{1}{x}$ a function? Explain.

- As $x \rightarrow -\infty$, what happens to the y-values?
- As $x \rightarrow \infty$, what happens to the y-values?
- Can you ever have a negative output for the function? Explain.
- State the domain and range of the function using all three representations.

Rational Transformations $f(x) = \left(\frac{A}{B(x-C)}\right) + D$ or $f(x) = A\left(\frac{1}{B(x-C)}\right) + D$

Affects of "A" –

Affects of "B" –

Affects of "C" –

- The "C" value changes the _____ asymptote and restricts the _____.

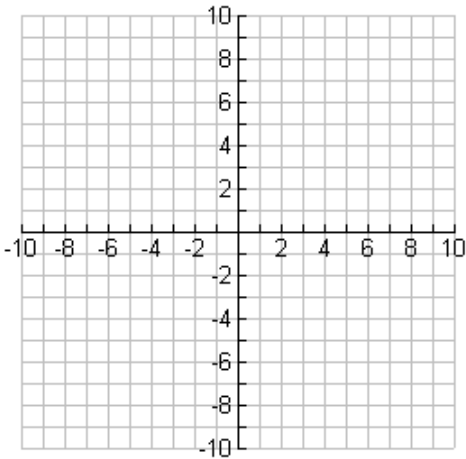
Affects of "D" –

- The "D" value changes the _____ asymptote and restricts the _____.

Do not forget the transformation order: Reflections, Stretches/Compressions, Translations.

For the following functions, graph and list the transformations, asymptotes, and domain and range.

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



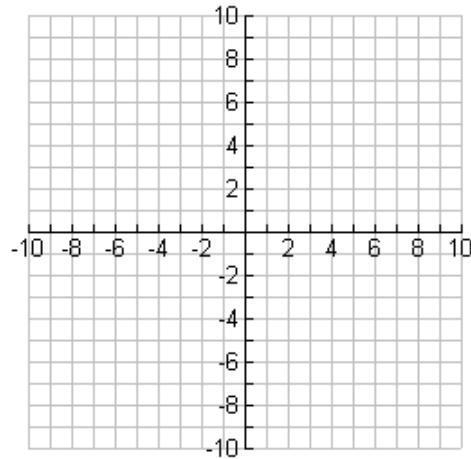
Trans: _____

VA: _____ HA: _____

Domain: _____

Range: _____

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



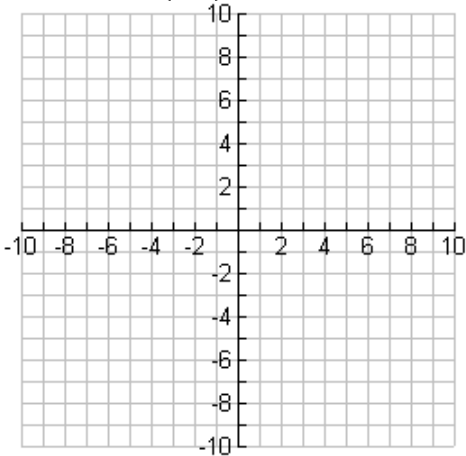
Trans: _____

VA: _____ HA: _____

Domain: _____

Range: _____

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



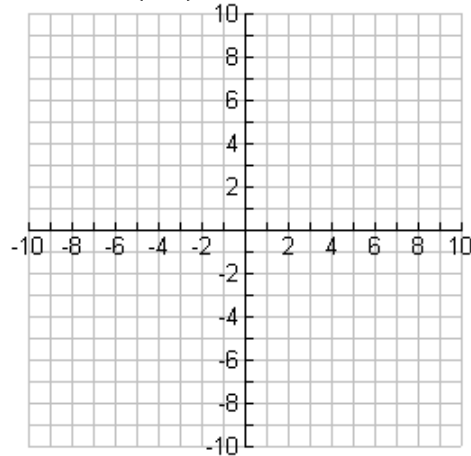
Trans: _____

VA: _____ HA: _____

Domain: _____

Range: _____

4. $y = \frac{1}{(x+2)^2} - 1$



Trans: _____

VA: _____ HA: _____

Domain: _____

Range: _____

Write a possible rational function for each description provided.

5. Vertical asymptote at $x = 2$ and a horizontal asymptote at $y = 0$.

6. Vertical asymptote at $x = -5$ and a horizontal asymptote at $y = 4$.

7. The domain is all real numbers except $x = 6$. The range is all real numbers except $y = -3$.

Identify the vertical asymptotes from the following table.

8.

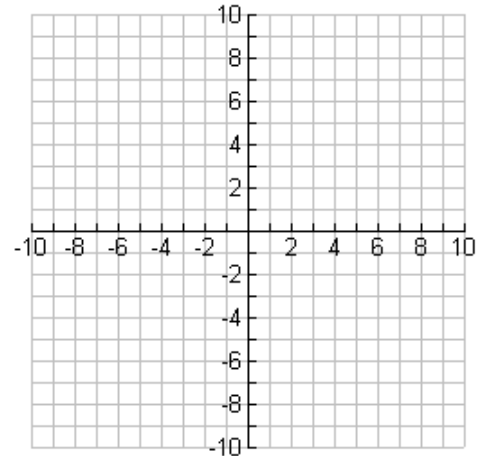
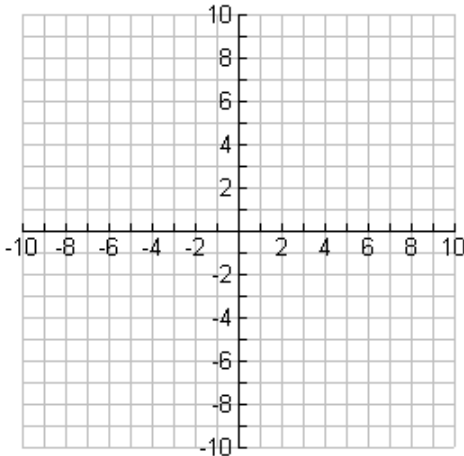
x	-4	-3	-2	-1	0	1	2
f(x)	-1	-3/2	-3	Und.	3	3/2	1

Transformations from a Transformed Graph

Desmos link: <http://bit.ly/2BCZNKr> . Sketch the following graphs by changing the sliders.

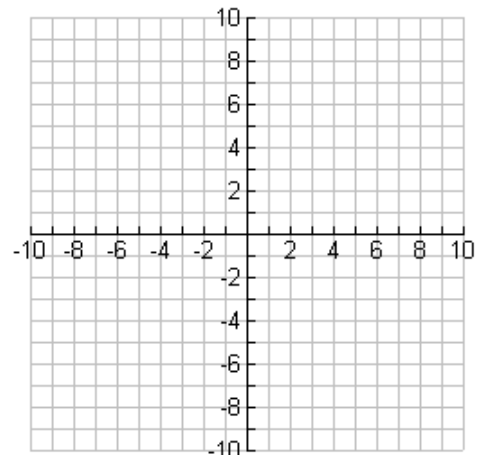
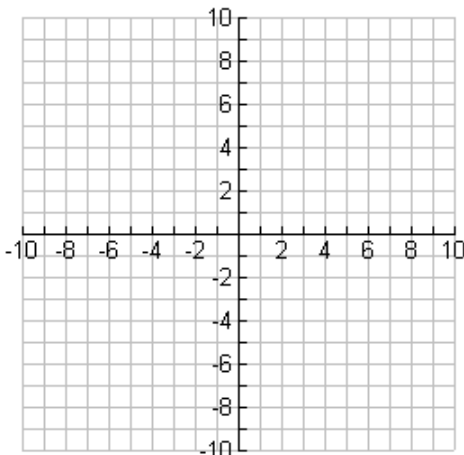
Sketch the original function given.

1. Change the A slider to -1. Graph $-f(x)$.



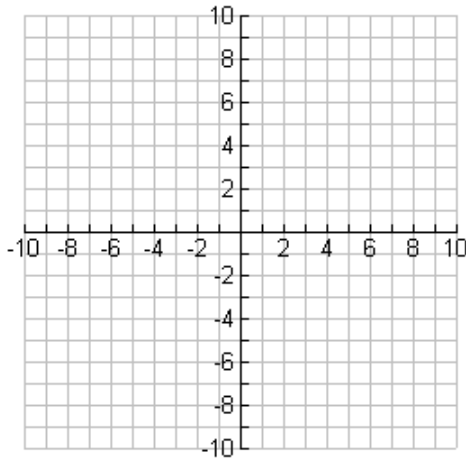
2. Change the B slider to -1. Graph $f(-x)$.

3. Change the D slider to -3. Graph $f(x) - 3$.



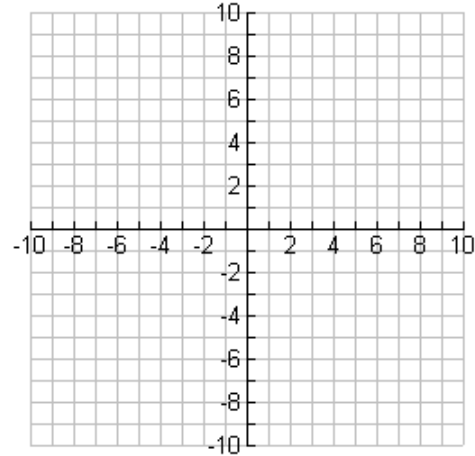
4. Change the C slider to 4 and the D slider to 2.

Graph $f(x - 4) + 2$.

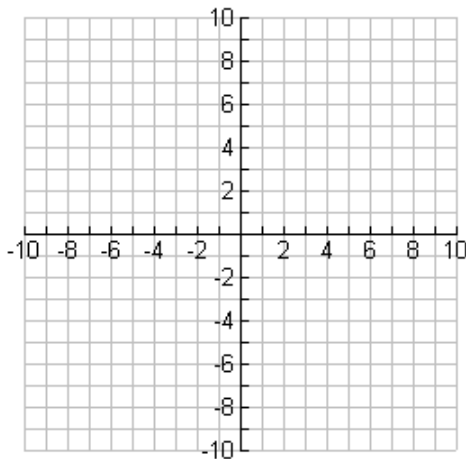


5. Change the B slider to -1 and D slider to -2.

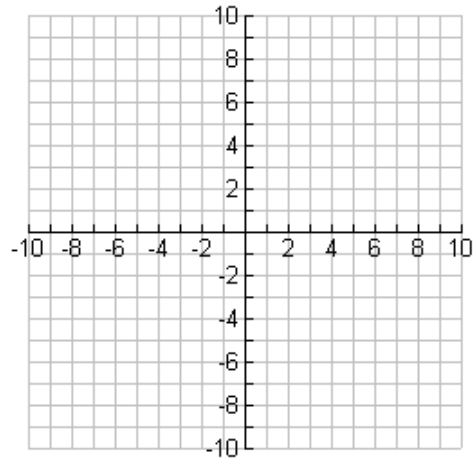
Graph $f(-x) - 2$.



6. Graph $-f(x-2) + 1$.



7. Graph $f(x+5) - 4$.



Things to think about from this activity...

- What type of transformations made the vertical asymptote change from the original graph? How did that affect the domain?
- What type of transformations made the horizontal asymptote change from the original graph? How did that affect the range?
- What do vertical reflections do to the original graph?
- What do horizontal reflections do to the original graph?