7-1 Rational Graphs

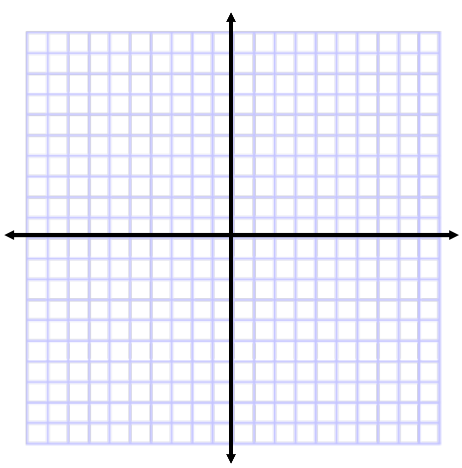
Objectives:

I can determine the domain, range, symmetry, end behavior, and intervals of increasing and decreasing of rational graphs.

I can identify the transformation of a given function and sketch a graph

I can write a rational equation given a graph.

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



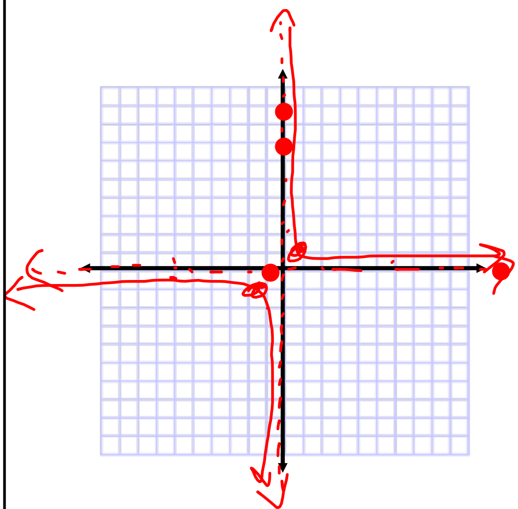
Domain
Range
Increasing
Decreasing
Left End Behavior

Right End Behavior

x-intercepts
y-intercepts
Vertical Asymptote(s):
Horizontal Asymptote:
One-to-One?

Rational w/ odd power

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



Domain $(-\infty, 0) \cup (0, \infty)$

Range $(-\infty, 0) \cup (0, \infty)$

Increasing n/a

Decreasing $(-\infty, 0) \cup (0, \infty)$

Left End Behavior $\lim_{x \to -\infty} f(x) = 0$

Right End Behavior $\lim_{x \to \infty} f(x) = 0$

x-intercepts

y-intercepts

N/A

Vertical Asymptote(s): $x = 0$

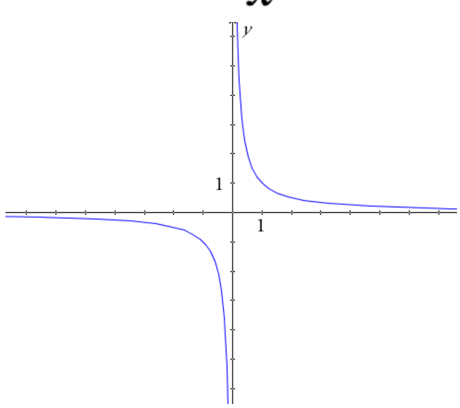
Horizontal Asymptote: $y = 0$

One-to-One?

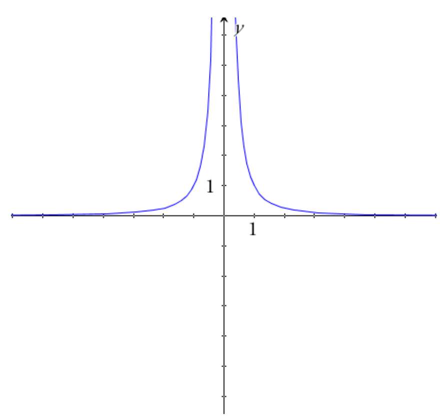
yes

Look at the following Graphs $f(x) = \frac{1}{x}$ and $f(x) = \frac{1}{x^2}$ and compare. What is going on?

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

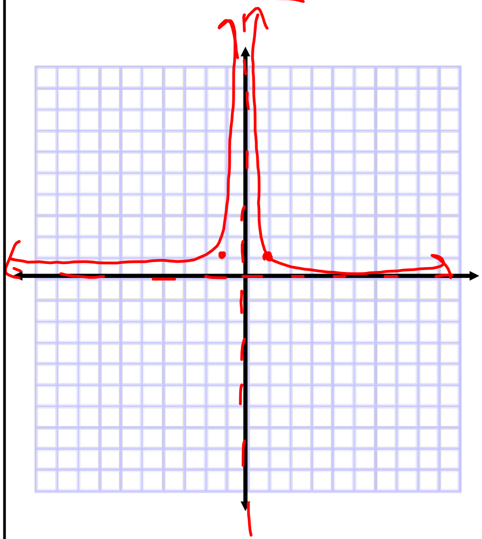


$$f(x) = \frac{1}{x^2}$$



Rational w/even power

Equation: $f(x)=\frac{1}{x^2}$



Domain $(-\infty,0)\cup(0,\infty)$

Range $(0,\infty)$

Increasing $(-\infty,0)$

Decreasing $(0,\infty)$

Left End Behavior $\lim_{x\to-\infty} f(x)=0$

Right End Behavior $\lim_{x\to\infty} f(x)=0$

x-intercepts N/A

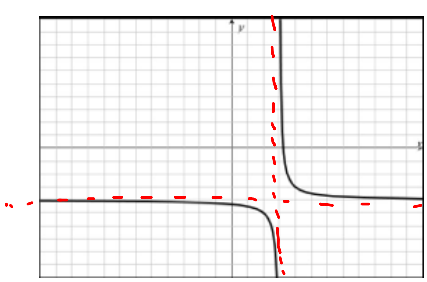
y-intercepts

Vertical Asymptote(s): $x=0$

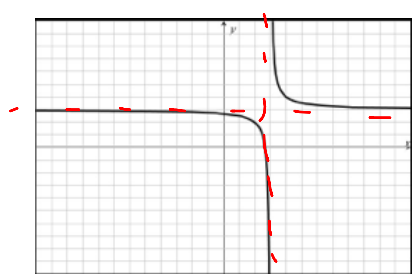
Horizontal Asymptote: $y=0$

One-to-One? NO

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



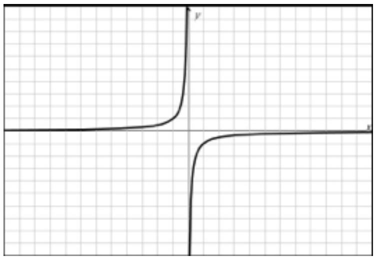
$$f(x)=\frac{1}{x-3}+3$$

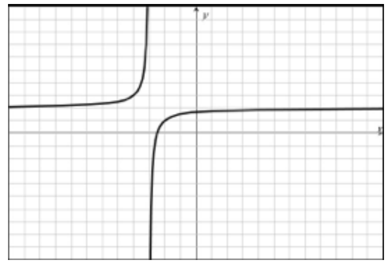


Based on the equations and corresponding graphs, what do you conclude about the transformations?

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

$$f(x) = -\frac{1}{x+3} + 2$$

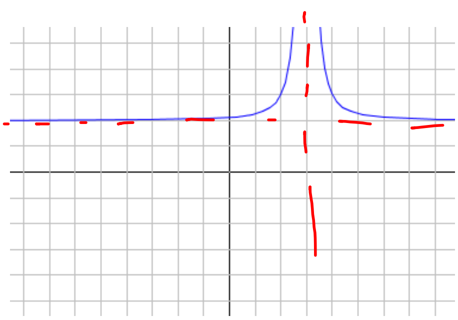


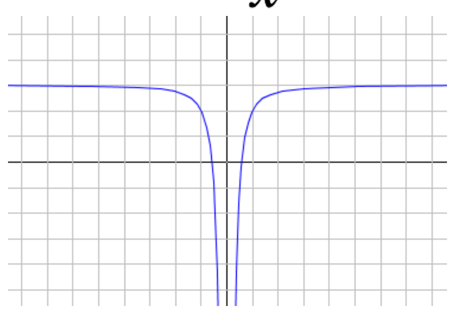


Based on the equations and corresponding graphs, what do you conclude about the transformations?

$$f(x) = \frac{1}{(x-3)^2} + 2$$

$$f(x) = -\frac{1}{x^2} + 3$$





Based on the equations and corresponding graphs, what do you conclude about the transformations?

Sketch a graph and analyze of the following.

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

Domain: $(-\infty, 0) \cup (0, \infty)$

Range: $(-\infty, 3) \cup (3, \infty)$

V Asymptote: $x = 0$

H Asymptote: $y = 3$

Increasing: $(-\infty, 0) \cup (0, \infty)$

Decreasing: N/A

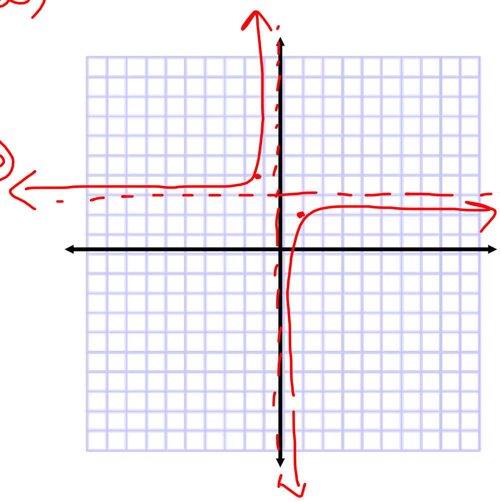
End Behavior:

$\lim_{x \to \pm\infty} f(x) = 3$

Asymptote behavior:

$\lim_{x \to 0^+} f(x) = -\infty$

$\lim_{x \to 0^-} f(x) = \infty$



Sketch a graph and analyze of the following.

$$f(x) = \frac{1}{(x+3)^2} + 1$$

Domain: $(-\infty, -3) \cup (-3, \infty)$

Range: $(1, \infty)$

V Asymptote: $x = -3$

H Asymptote: $y = 1$

Increasing: $(-\infty, -3)$

Decreasing: $(-3, \infty)$

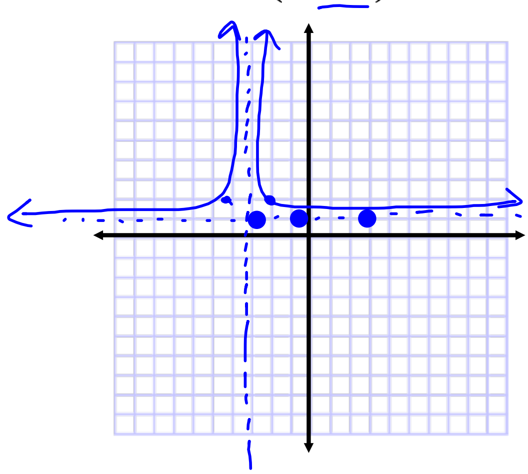
End Behavior:

$\lim_{x \to \pm\infty} f(x) = 1$

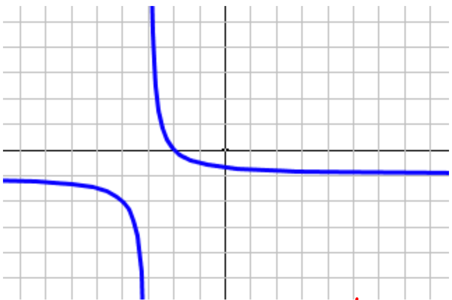
Asymptote behavior:

$\lim_{x \to -3^+} f(x) = \infty$

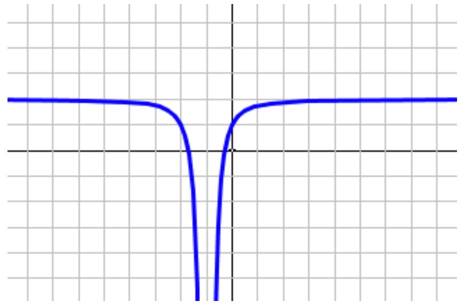
$\lim_{x \to -3^-} f(x) = \infty$



Based on the conclusions you made, work with a partner to write an equation based on the following graphs.



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



$$f(x) = -\frac{1}{(x+1)^2} + 2$$

When given a rational function in the form of $f(x) = \dfrac{mx+n}{px+q}$ where $m \neq 0$ and $p \neq 0$, you can use division to re-write the function in a form to identify the transformations.

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

$$3 + \frac{-1}{x-1}$$

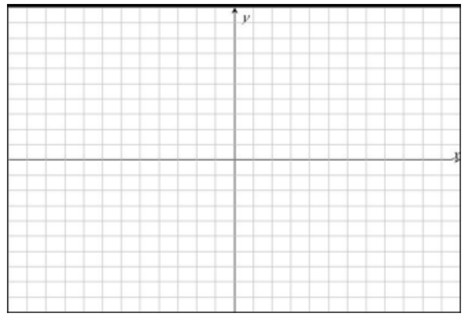
$$x-1 \overline{)\,3x-4}$$

$$+(-3x+3)$$

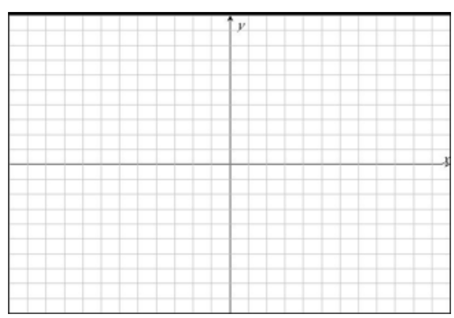
$$-1$$

$$\boxed{f(x) = \frac{-1}{x-1} + 3}$$

Given $f(x)=\dfrac{4x+7}{x+4}$, use division to re-write the function and identify the transformations. Then sketch a graph and state the domain, range, and intervals of increasing and decreasing.



Given $f(x)=\dfrac{3x+7}{x+2}$, use division to re-write the function and identify the transformations. Then sketch a graph and analyze.



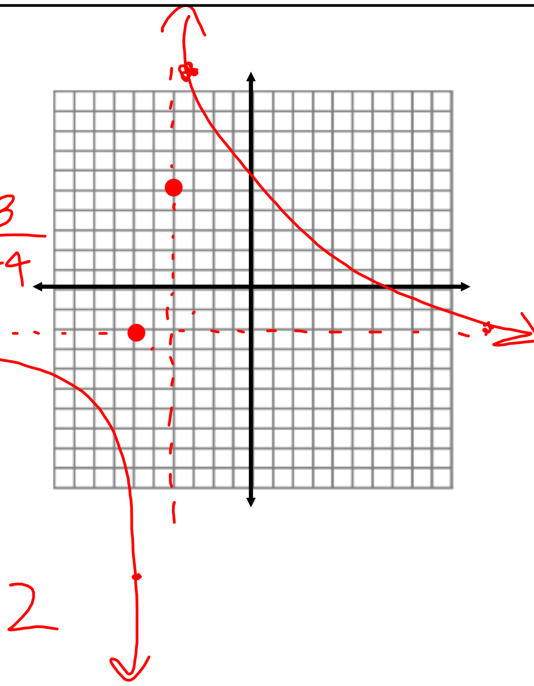
$$f(x)=\frac{5-2x}{x+4}$$

$$-2+\frac{13}{x+4}$$

$$x+4\,\big)\ -2x+5$$

$$+\,(+2x+8)$$

$$13$$



$$f(x)=\frac{13}{x+4}-2$$