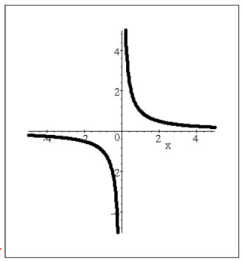
Graphs of the Reciprocal Function and its transformations.



The Parent Reciprocal Function

$$y = \frac{1}{X}$$

Vertical Asymptotes:

the y-axis
EQ: x=0

Horizontal Asymptotes:

the x-axis
EQ: y=0

$$y = \frac{a}{X}$$ a > 1

a is pos:

Branches are in the
1st and 3rd Quadrants

a is neg:

Branches are in the
2nd and 4th Quadrants

a is large: a>1 or a< -1

Branches are further
from the asymptotes

Vertical Stretch Factor

a is small: -1<a<1 but not 0

Branches are closer to
the asymptotes

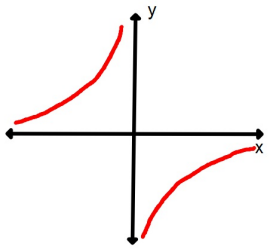
Vertical Shrink Factor

On your paper sketch what each would look like w/o using a calculator.

$$y = \frac{-20}{x}$$

Neg a: branches are in "Quadrants II and IV".

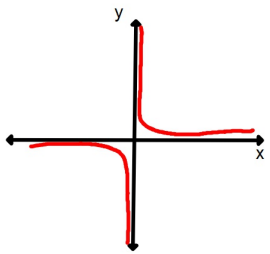
Large a: branches "far" from asymptotes.



$$y = \frac{0.3}{x}$$

Pos a: branches are in "Quadrants I and III".

Small a: branches "close" to asymptotes.



$$Y_1 = \frac{28.6}{x - 47} + 73$$

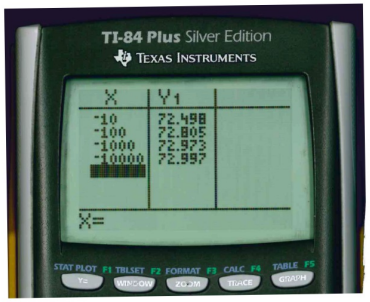
What do you think the Vertical and Horizontal Asymptotes of this function are?

$$Y_1 = \frac{28.6}{x - 47} + 73$$

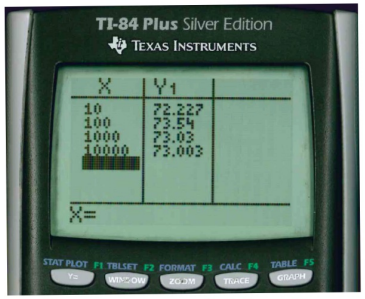
The vertical asymptote is created by the value of x that makes this function undefined.

VA: x = 47

What do these two calculator screens tell you?



As you move left on the graph y gets closer to 73 but just a little bit less (below).



As you move right on the graph y gets closer to 73 but just a little bit more (above).

The farther from the origin you are (both left and right) the closer the function gets to 73.....the graph flattens out and approaches the horizontal line y = 73

HA: y = 73

$$y = a(x - h)^2 + k \qquad y = a|x - h| + k$$

a: Vertical Stretch or Shrink Factor
if a<0 there is an x-axis reflection (Upside Down)

h: Horizontal Translation

k: Vertical Translation

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

The larger a is... the farther the branches are from the asymptotes
The smaller a is...the closer the branches are to the asymptotes

a: Vertical Stretch or Shrink Factor
if a<0 there is an x-axis reflection (Upside Down)

a>0: branches are in "Quadrants I & III"
a<0: branches are in "Quadrants II & IV"

h: Horizontal Translation

Vertical Asymptote becomes: x = h

k: Vertical Translation

Horizontal Asymptote becomes: y = k

What are the two asymptotes for each reciprocal function?

1. $y = \frac{30}{x-7} + 2$

Moved 2 up
Moved 7 right

VA: $x = 7$ HA: $y = 2$

2. $y = \frac{-0.3}{x+5} - 8$

Moved 8 down
Moved 5 left

VA: $x = -5$ HA: $y = -8$

Write an equation for the translation of $y = \frac{3}{x}$ that has the given asymptotes.

1. y = 4 and x = -3

Moved 4 up
Moved 3 left

$y = \frac{3}{x+3} + 4$

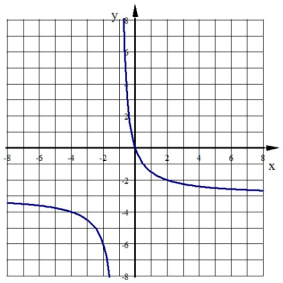
2. y = 0 and x = 9

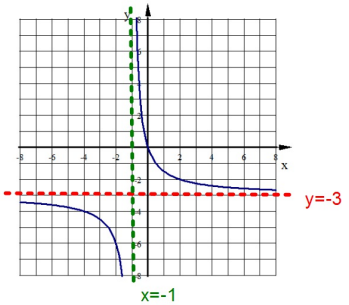
didn't move up or down
Moved 9 right

$y = \frac{3}{x-9}$

For 1 and 2, write the equation of each graph which are tranformations of the equation: $y = \frac{3}{x}$

1.



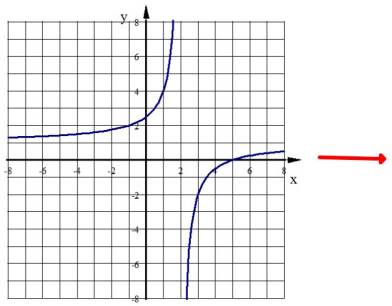


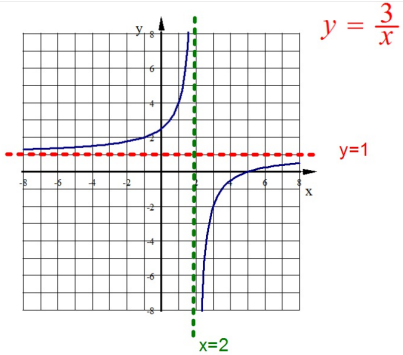
Moved 3 down and 1 left

Branches are in "Quadrants I and III" - NO x-axis reflection

EQ: $y = \frac{3}{x+1} - 3$

2.





Moved 1 up and 2 right

Branches are in "Quadrants II and IV" - x-axis reflection

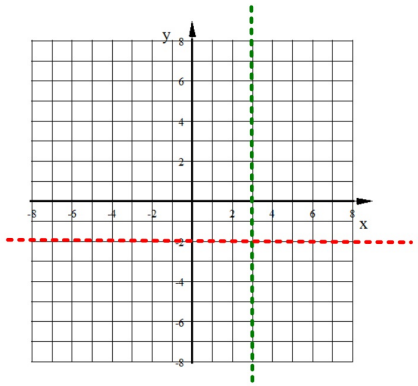
EQ: $y = \frac{-3}{x-2} + 1$

For 3 and 4, sketch the graph of each.
Show asymptotes as dashed lines.

3. $y = \frac{-0.1}{x-3} - 2$

Moved 2 down: HA: y = -2
Moved 3 right: VA: x=3

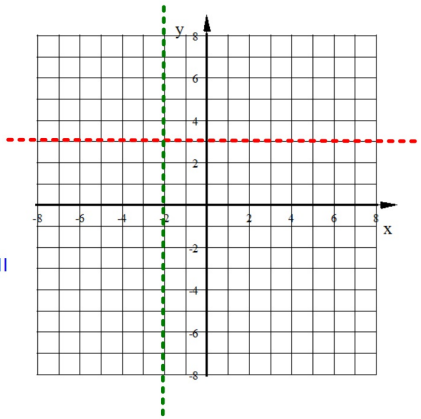
x-axis reflection: Branches in Quadrants II and IV
a is small - branches are close to asymptotes



4. $y = \frac{15}{x+2} + 3$

Moved 3 up: HA: y = 3
Moved 2 left: VA: x= -2

NO x-axis reflection: Branches in Quadrants I and III
a is big - branches are far from asymptotes



Write the equation of each transformation of the Parent Reciprocal Function y = 1/x

1. 5 units left, twice as tall, branches are in quadrants I and III

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

2. 8 units up, half as tall, branches are in quadrants II and IV

$y = \frac{+0.5}{x} + 8$

3. 3 units right, 2 units down, branches are in quadrants II and IV

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

Hwk #40

Due Monday, January 6, 2020

Practice Sheet - Graphs of Reciprocal Functions