Asymptotes for the Reciprocal Function:

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

Horizontal Asymptote: y = 0

Vertical Asymptote: x = 0

Horizontal Asymptotes:

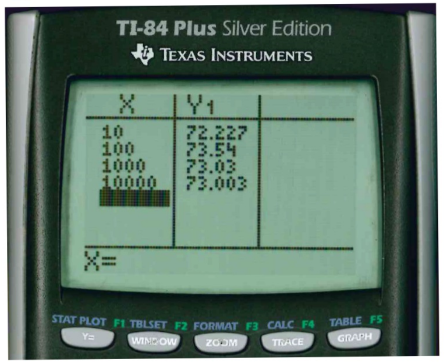
HA are the end-behavior of a graph which means it describes how the graph is behaving at the far left and far right.

Enter this equation and use the Table function of the graphing calculator to find the Horizontal Asymptote.

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

To find the right end-behavior enter larger and larger positive values for x to simulate moving to the far right of the graph and notice how the function is behaving (what is the value of y doing?)

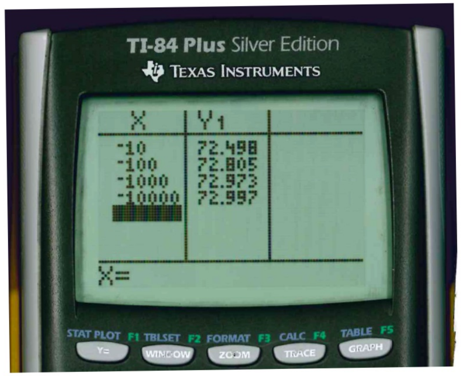
Right-end Behavior



This table shows that the function (y-values) approaches 73, but is always a little more, as you move to the right (x-values get larger positive)

To find the left end-behavior enter larger and larger negative values for x to simulate moving to the far left of the graph and notice how the function is behaving (what is the value of y doing?)

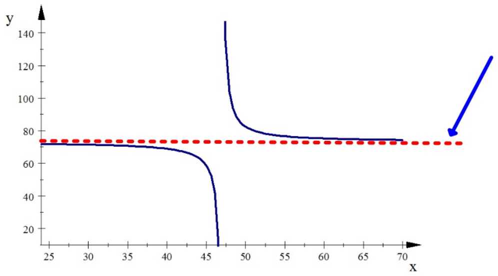
Left-end Behavior



This table shows that the function (y-values) approaches 73, but is always a little less, as you move to the left (x-values get larger negative)

Both the left and right end-behavior tells us that the graph approaches the y-value of 73 the farther you move away from the origin.

This is shown as the Horizontal Asymptote y=73. On the left-side the graph gets closer to the line y=73 but stays just below it. On the right-side the graph gets closer to the line y=73 but stays just above it.



HA: y = 73

How has $y = x^2$ been translated to create the parabola from the equation below?

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

Up or down translation

Left or right translation

What are the coordinates of the vertex?

(h, k)

How could you change the Vertical Asymptote of $y = \frac{a}{x}$?

Shift the graph left or right $y = \frac{a}{x - h}$

left or right translation

Moving left or right will only affect the Vertical Asymptote:

VA: $x = h$

How could you change the Horizontal Asymptote of $y = \frac{a}{x}$?

Shift the graph up or down: $y = \frac{a}{x} + k$

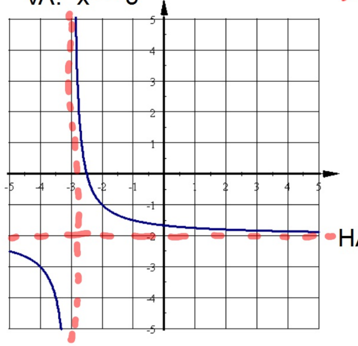
up or down translation

Moving up or down will only affect the Horizontal Asymptote:

HA: $y = k$

Write the equation of this function which is a translation of $y = \frac{1}{x}$

VA: $x = -3$



HA: $y = -2$

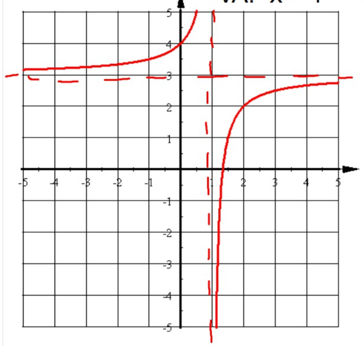
VA: $\underbrace{x = -3}_{3 \text{ left}}$

HA: $\underbrace{y = -2}_{2 \text{ down}}$

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

Write the equation of this function which is a translation of $y = \frac{1}{x}$

VA: $x = 1$



HA: $y = 3$

VA: $\underbrace{x = 1}_{1 \text{ RIGHT}}$

HA: $\underbrace{y = 3}_{3 \text{ up}}$

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

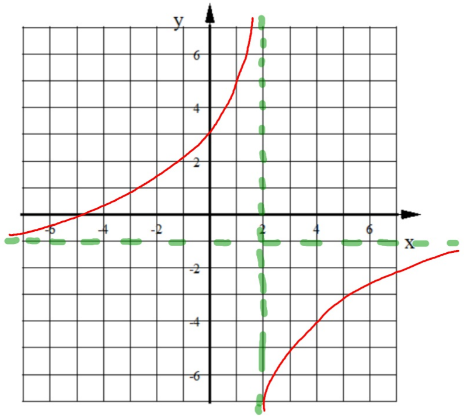
Sketch the graph of this function:

$$y = \frac{-1}{\underbrace{x-2}_{2\ RT}} - 1$$

1 down

VA: X = 2

HA: Y = -1



Make the asymptotes dashed lines. Because of the negative numerator the branches are in Quadrants II and IV. To draw the branches starte close to one of the asymptotes, draw a curve and end up close to the other asymptote.

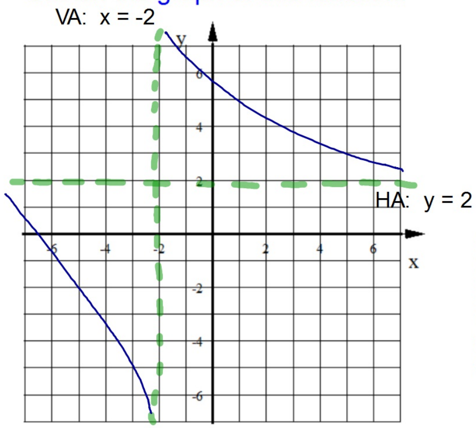
Sketch the graph of this function:

$$y = \frac{10}{\underbrace{x+2}_{2\ \text{Left}}} + 2$$

2 up

VA: X = -2

HA: Y = 2



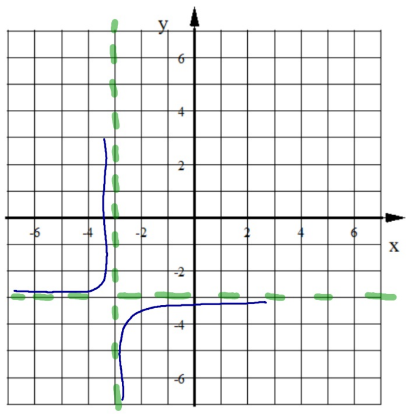
Make the asymptotes dashed lines. Because of the Positive numerator the branches are in Quadrants I and III. Because the numerator is quite large draw the branches so that they stay "far" away from the intersection of the asymptotes.

Sketch the graph of this function:

$$y = \frac{-0.1}{\underbrace{x+3}_{3\ \text{Left}}} \underbrace{- 3}_{3\ \text{down}}$$

VA: X = -3

HA: Y = -3



Make the asymptotes dashed lines. Because of the Negative numerator the branches are in Quadrants II and IV. Because the numerator is quite small draw the branches so that they stay "close" to the asymptotes and come "close" to the intersection of the asymptotes.