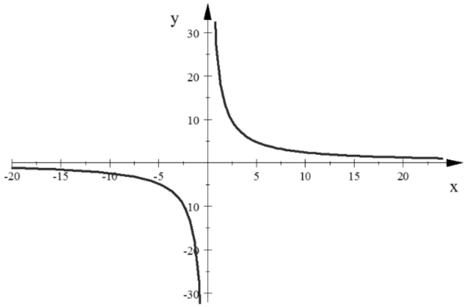
The graph of Inverse Variation is called: a Hyperbola




$y = \frac{24}{x}$

Why is there two parts to this graph?

Because you are not allowed to use the value x=0 since it makes the function undefined.

Each part of this graph is referred to as a BRANCH

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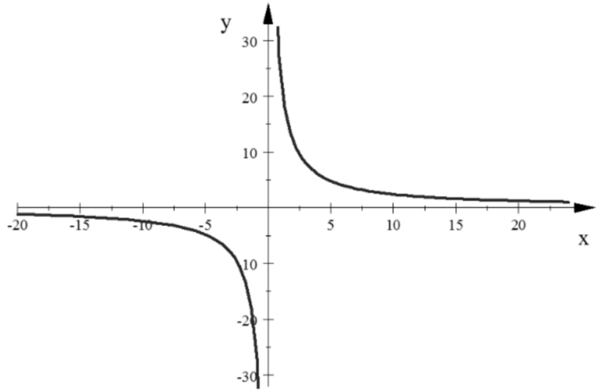
The equation of this graph is $y = \frac{24}{x}$ or $xy = 24$




Why does the graph get closer to the x-axis as you move farther to the right?

24 ÷ by bigger numbers gets smaller and smaller.

Will the graph ever reach the x-axis? NO

Why?

No matter what you plug in for x,

$\frac{24}{x}$ will never = 0.

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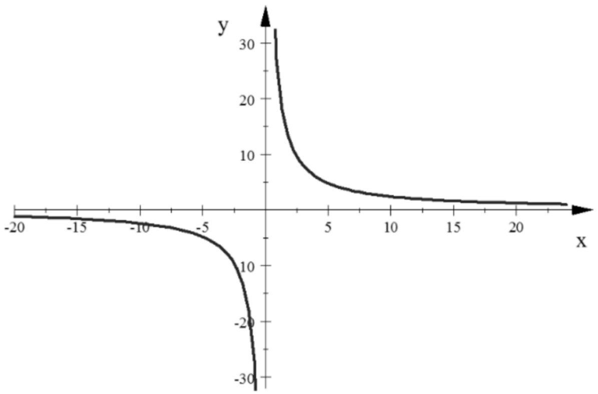
The equation of this graph is $y = \frac{24}{x}$ or $xy = 24$




Why does the graph increase rapidly as you approach the y-axis from the right?

24 ÷ positive numbers between 0 and1 becomes bigger positive the closer the denominator gets to 0.

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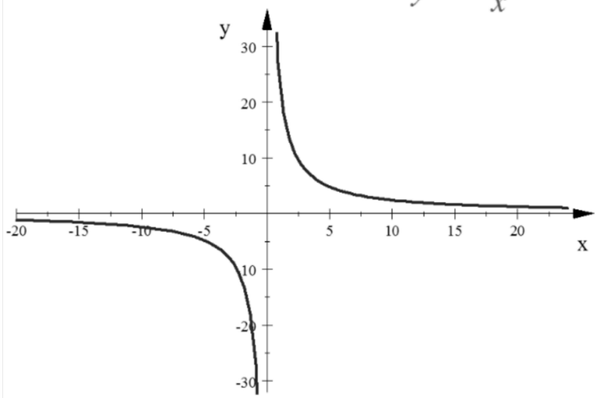
The equation of this graph is $y = \frac{24}{x}$ or $xy = 24$



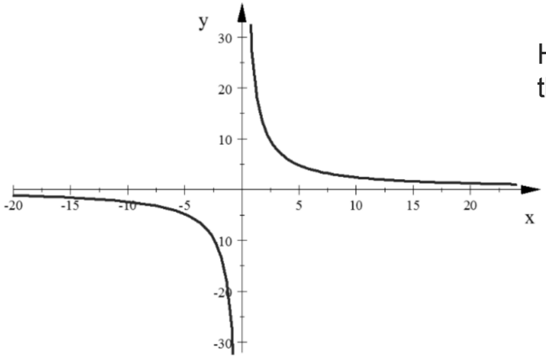

Why does the graph decrease rapidly as you approach the y-axis from the left?

24 ÷ numbers between -1 and 0 becomes bigger negative the closer the denominator gets to zero.

Will the graph ever reach the y-axis?

Why?

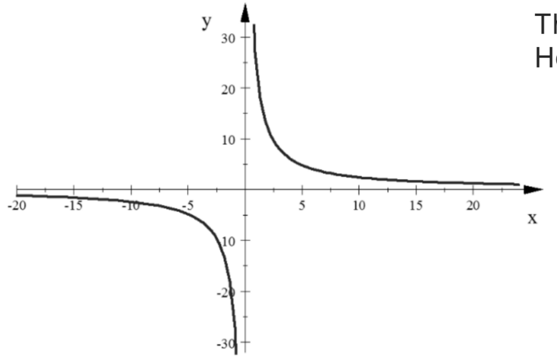
x can NEVER be 0



How would you describe
the end-behavior of this graph?

$$(\leftarrow, \rightarrow)$$

This graph has a
Horizontal Asymptote.



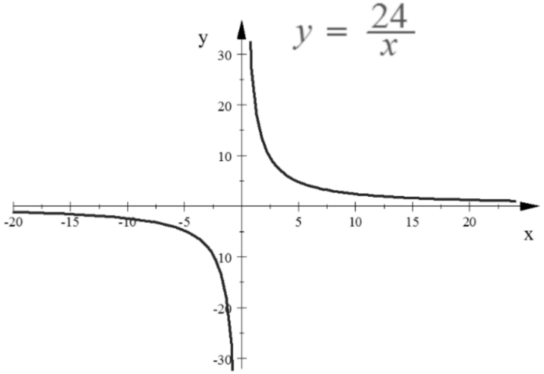
This graph has a
Horizontal Asymptote of $y = 0$

What is an Asymptote?

A line a graph approaches the further from the origin you are, but it never quite gets to the line.

Horizontal Asymptotes are
the graphs END-BEHAVIOR

$$y = \frac{24}{x}$$



What other asymptote
does this graph have?

Vertical Asymptote at x=0

Why does it have
a Vertical Asymptote at
x=0?

Because you are not allowed
to use the value x=0 since
it makes the function undefined.

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

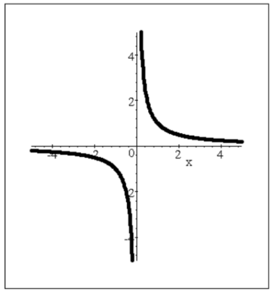
is an example of a $\underbrace{\text{Rational Equation}}_{\text{The ratio of two polynomials}}$

$$y = \frac{k}{x}$$ Is also referred to as:

The Reciprocal Family of Functions

The Parent Function: $y = \frac{1}{x}$

Graph this function in a Standard Window.



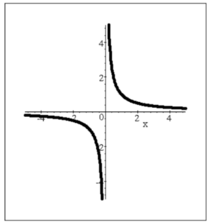
The graph of $y = \frac{1}{x}$

<u>Vertical Asymptote</u>

the y-axis
EQ: x=0

<u>Horizontal Asymptote</u>

the x-axis
EQ: y=0



The graph of $y = \frac{1}{x}$

Describe the location of the two branches of this hyperbola.

Quadrants I & III

Leave $Y_1$ as the parent Reciprocal Function $y = \frac{1}{x}$

In $Y_2$ graph $y = \frac{k}{x}$ for different values of k.

What does the value of k do to the graph of $y = \frac{1}{x}$ ?

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

k is pos:

Branches are in the 1st and 3rd Quadrants

k is neg:

Branches are in the 2nd and 4th Quadrants

k is large:

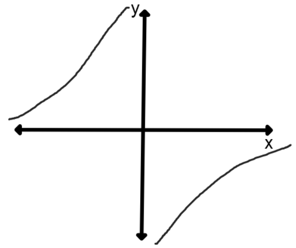
Branches are further from the origin

k is small:

Branches are closer to the origin

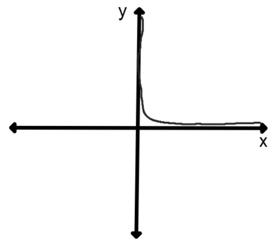
Without using a graphing calculator sketch the graph of each:

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




Negative means it has flipped into Quadrants II and IV.
k=20 means the branches are pushed far from the origin

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




Positive means branches are still in Quadrants I and III.
k=0.3 means branches are shrunk closer to the origin.

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

What do you think the Vertical Asymptote of this function is?

x = 47

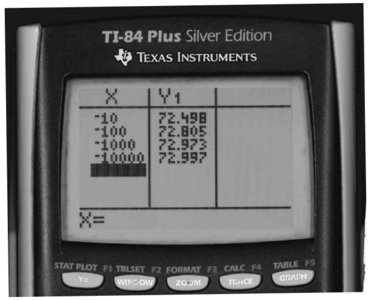
x can NEVER be 47 because it would make this equation undefined. But, you can plug in values very close to 47.

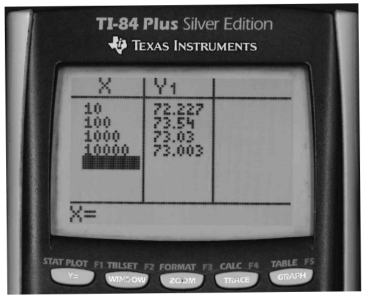
$$Y_1 = \frac{28.6}{x-47} + 73$$

What do you think the Horizontal Asymptote of this function is?

What do these two calculator screens tell you?

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




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

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 "origin"
The smaller a is...the closer the branches are to the "origin"

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

7 right and 2 up

HA: $y = 2$

VA: $x = 7$

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

5 left and 8 down

HA: $y = -8$

VA: $x = -5$

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

1. y = 4 and x = -3

3 left
and 4 up

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

2. y = 0 and x = 9

9 right no vertical movement

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

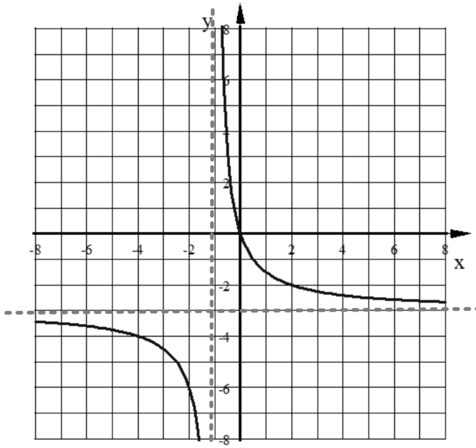
3. y = -5 and x = 0

No horizontal movement but 5 down.

$$y = \frac{3}{x} - 5$$

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

1.




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

HA is y = -3 which means the graph has moved 3 units down.

VA is x = -1 which means the graph has moved 1 unit left.