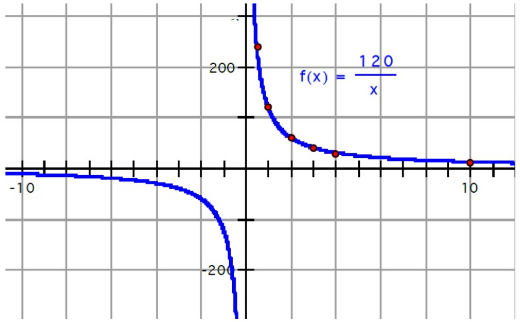
From Yesterday:

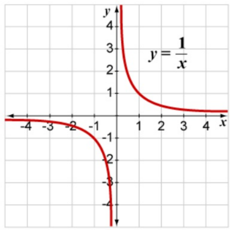
Hours to travel 120 miles	Process	Speed
2	$\frac{120 \text{ miles}}{2 \text{ hours}}$	60 mph
3	$\frac{120}{3}$	40 mph
4	$\frac{120}{4}$	30 mph
10	$\frac{120}{10}$	12 mph
h	$\frac{120}{h}$	$\frac{120}{h}$ mph

Graph of the data on the previous page:



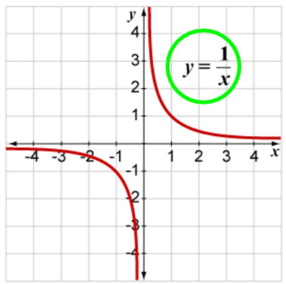
This is an example of a specific rational function called:
Inverse Variation

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



This equation is sometimes referred to as the Reciprocal Function.

This graph is called a Hyperbola.

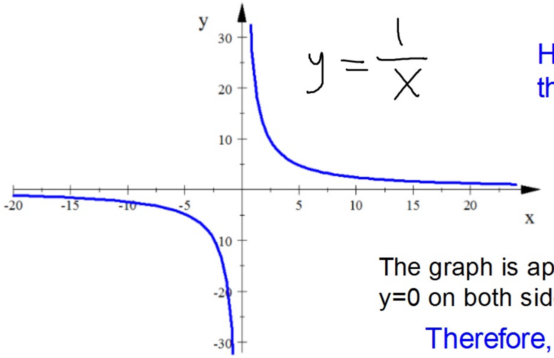


Why does this graph have two parts?
because the function is undefined when x=0, therefore, there is a break in the graph at that point.

The two parts of this graph are called Branches.

There are two lines the graph approaches as you move farther from the origin. These lines are called Asymptotes.

The branches of the Parent Reciprocal Function are located in "Quadrants I and III".



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

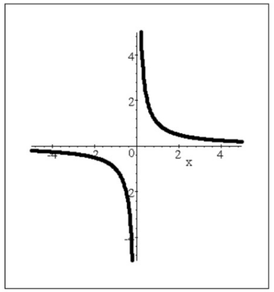
How would you describe the end-behavior of this graph?

As $x \to -\infty$, $y \to 0$

As $x \to \infty$, $y \to 0$

The graph is approaching the horizontal line y=0 on both sides.

Therefore, this graph has a Horizontal Asymptote.



The Parent Reciprocal Function

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

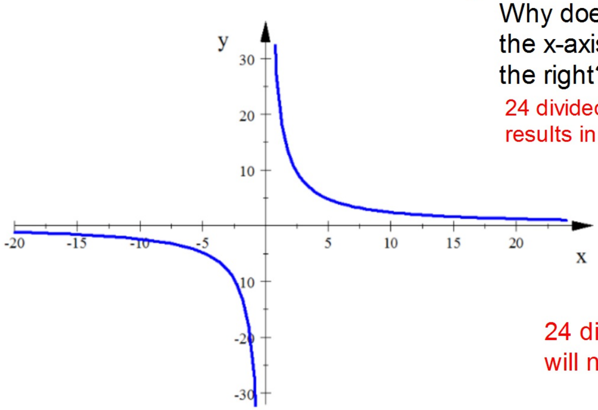
<u>Vertical Asymptote</u>

the y-axis
EQ: x=0

<u>Horizontal Asymptote</u>

the x-axis
EQ: y=0

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



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

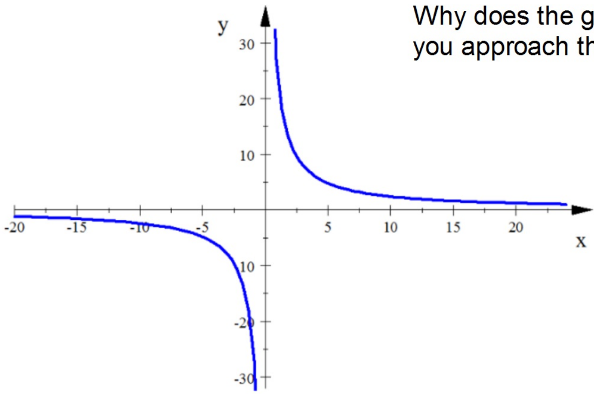
24 divided by bigger and bigger #'s results in smaller and smaller y-values

Will the graph ever reach the x-axis?

Why?

24 divided by any number will never equal zero.

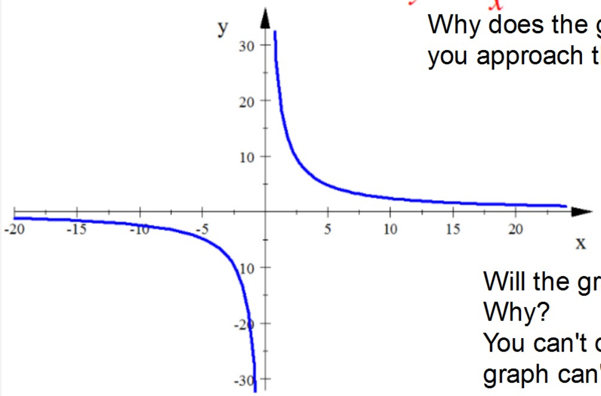
The equation of this graph is $y = \frac{24}{x}$



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

dividing 24 by samller and smaller numbers results in bigger and bigger y-values.

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



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

dividing 24 by samller and smaller negative numbers results in bigger and bigger negative y-values.

Will the graph ever reach the y-axis? Why?
You can't divide 24 by zero so the graph can't exist when x=0.

Use your graphing calculator.

1. Graph Y_1 as the parent Reciprocal Function $y = \frac{1}{X}$

2. In Y_2 graph $y = \frac{a}{X}$ for different values of a.

3. What does the value of a do to the graph of $y = \frac{1}{X}$?

Agilemind website: Topic 9, Exploring:

Graphing rational functions (page 3)

You can use this animation to see what changing values of a does to the graph.

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

a is pos:
Branches are in the 1st and 3rd Quadrants

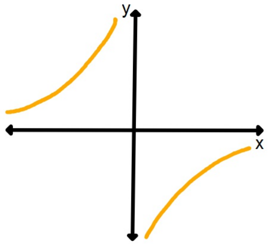
a is neg:
Branches are in the 2nd and 4th Quadrants

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

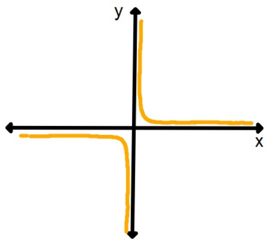
On your paper sketch what each would look like w/o using a calculator.

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



a is negative so the branches are in Quadrants II and IV.
a is large so the branches are far from the asympotes

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



a is positive so the branches are in Quadrants I and III.
a is small so the branches stay close to the asympotes