

Notes 4.1

Investigation – Basic Rational Functions

You and some friends are planning to start a business. You will all share equally any profits or losses. The total profit or loss will be considered as 100% or 1.

What percent would you make or lose if it was just you and one friend? 50% or .5

What percent would you make or lose if it was you and two friends? 33% or .33

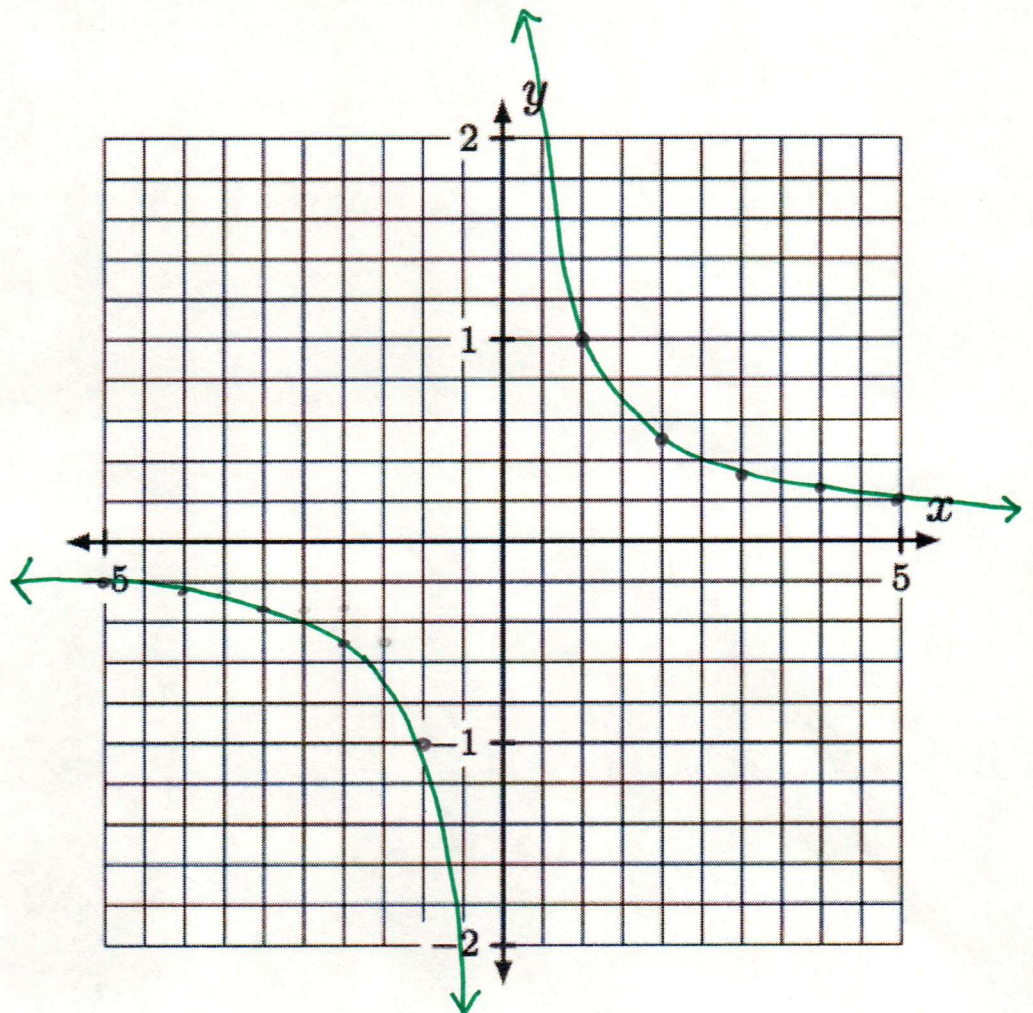
Write an equation that may represent the situation.

$$y = \frac{1}{x} \leftarrow \begin{array}{l} 100\% \text{ of profit/loss} \\ \text{total \# of people} \end{array}$$

Create a table and a graph that represents the situation.

A positive x is a happy person because there was a profit, a negative x is an unhappy person because there was a loss.

x	y
-5	-.2
-4	-.25
-3	-.33
-2	-.5
-1	-1
0	error
1	1
2	.5
3	.33
4	.25
5	.2



What happens as $x \rightarrow \infty$?

As $x \rightarrow \infty$, the y values go to zero \rightarrow

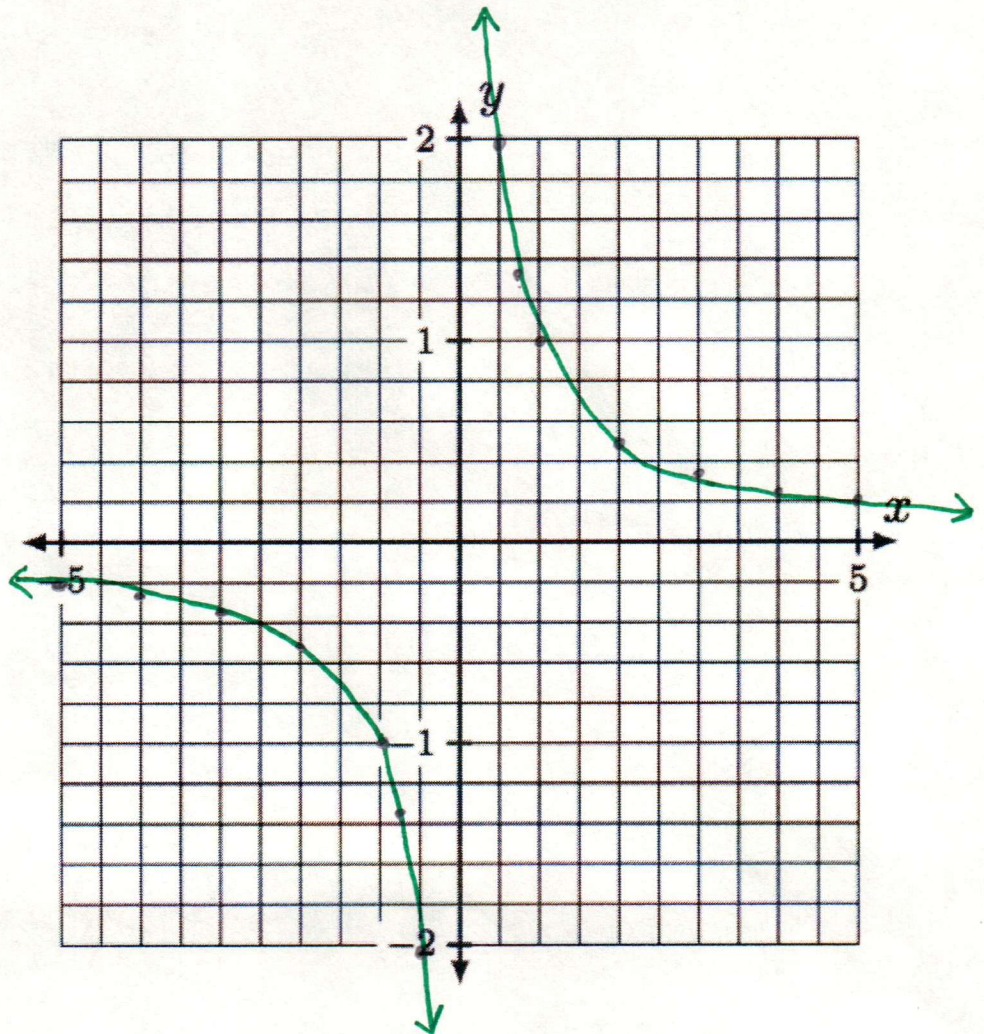
What happens as $x \rightarrow -\infty$?

As $x \rightarrow -\infty$, the y values go to zero \leftarrow

Let's change the scenario to see what happens between (0, 1]. If you want each person's responsibility (x) to be $\frac{1}{2}$ of the profit or loss, how many people (y) would be part of the business?

Create a table and a graph that represents the fractional values for x .

x	y
$-\frac{3}{4}$	-1.33
$-\frac{1}{2}$	-2
$-\frac{1}{4}$	-4
0	error
$\frac{1}{4}$	4
$\frac{1}{2}$	2
$\frac{3}{4}$	1.33



Can zero people be a part of the business? Why? If no people are part of the business, there is no business.

Will there ever be zero money to be split? Why? It is highly unlikely that the business will break even exactly. There

Do you ever think there will be more than one horizontal and vertical asymptote in a rational function? Try some other rational functions on your graphing calculator or desmos.com.

There cannot be more than one horizontal asymptote.

There can be one or more vertical asymptotes.

There are also slant asymptotes.

How do you think you will be able to find the vertical asymptotes in any rational function?

Any number that makes the denominator zero will be an asymptote.

Vocabulary

Word	Meaning/Notation	Example
Rational Function	A function that is a polynomial divided by a polynomial.	$y = \frac{x-2}{x^2-9}$