Unit 4 Day 3

Graphing Inverse Variation Functions

Warm Up

1) Fill in the following table using the function $y = \frac{4}{x-3} - 1.5$

x	y
-5	-2
-3	-2.167
-1	-2.5
1	-3.5
3	----
5	.5
7	-.5

Why is this function undefined at 3??

2) Given $f(x) = \sqrt{9x-36} + 16$

a. Find the vertex form of f(x)

$$y = 3\sqrt{x-4} + 16$$

Then, find

b. Its vertex (4, 16)

c. How it is translated from the parent graph

d. Its domain [4, ∞)

e. Its range [16, ∞)

Vertical stretch by 3, right 4, up 16

Extra Practice!
At the end of yesterdays notes ☺

1) Given $f(x) = 3x - 2x^2$
Evaluate $f(2x + 2) - f(x)$

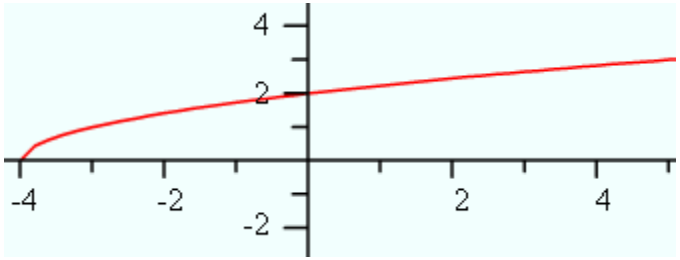
$-6x^2 - 13x - 2$

2) Given $g(x) = 2x^2 + 4$
Evaluate $g(x - 1) + g(3)$

$2x^2 - 4x + 28$

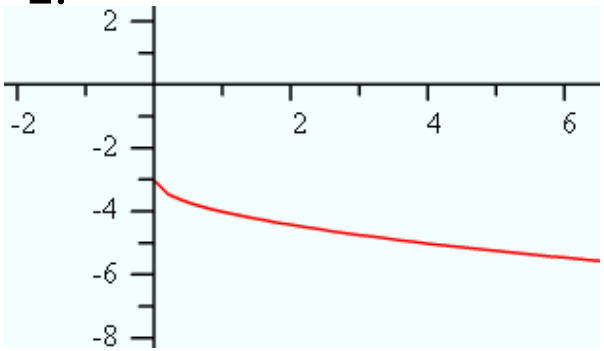
Homework Answers Packet p.3

1.



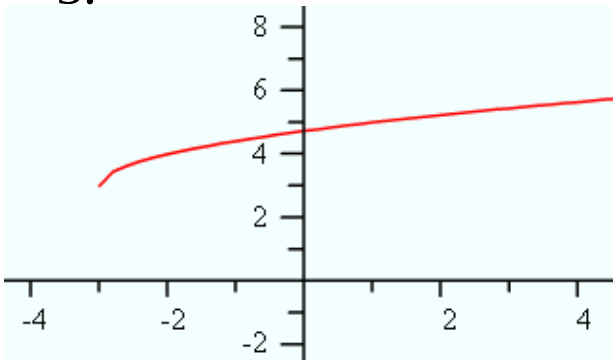
Domain: [-4, ∞)
Range: [0, ∞)
Shift 4 units left.

2.



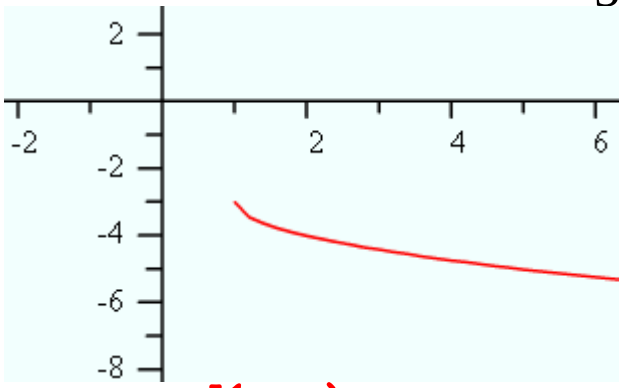
Domain : [0, ∞)
Range: (-∞, -3]
Reflect over x-axis THEN shift 3 units down.

3.



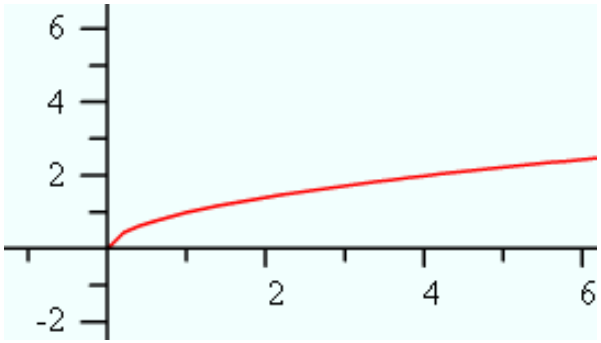
Domain : [-3, ∞)
Range [3, ∞)
Shift 3 units left, 3 units up.

4.



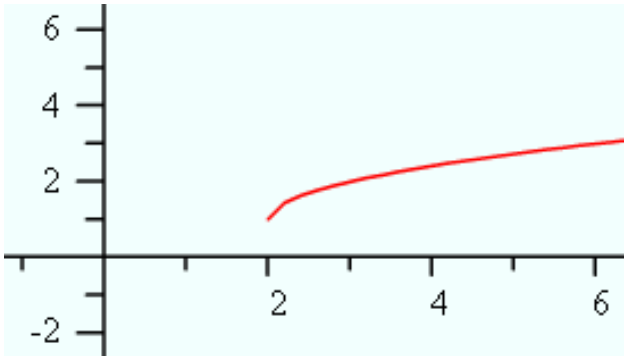
Domain : [1, ∞)
Range: (-∞, -3]
Reflect over x-axis THEN shift 3 units down, 1 unit right

5.



Domain : [0, ∞)
Range: [0, ∞)

6.

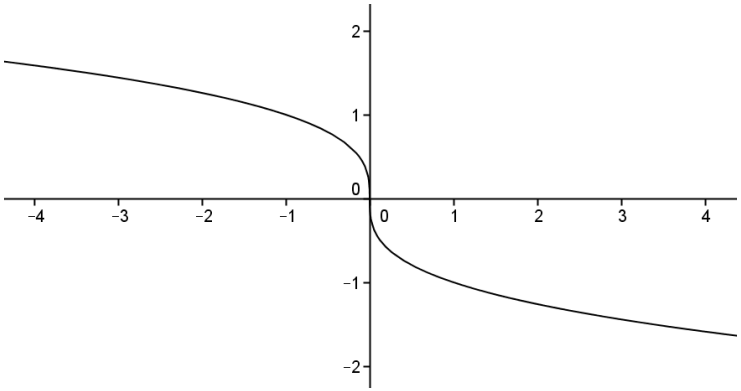


Domain : [2, ∞)
Range: [1, ∞)
Shift 2 units right, 1 units up.

Homework Answers Packet p.4

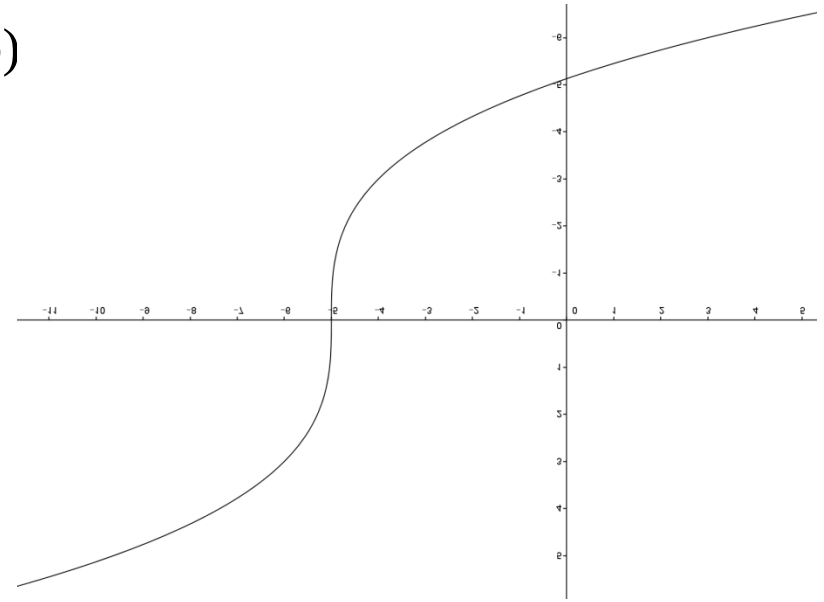
a) Shifted right 3 units
b) Shifted left 4 units
c) Reflected over x-axis, Vertical stretch by a factor of 3
d) Shifted up 5 units
e) Shifted down 6 units
f) Shifted right 2 units, up 7 units, vertical stretch by a factor of 3

a)



Domain : $(-\infty, \infty)$
Range: $(-\infty, \infty)$

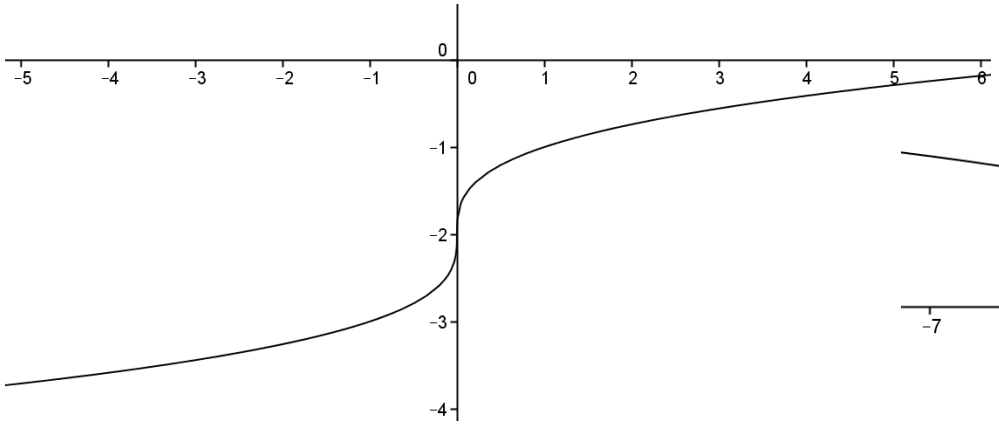
b)



Domain : $(-\infty, \infty)$
Range: $(-\infty, \infty)$

Homework Answers Packet p.4

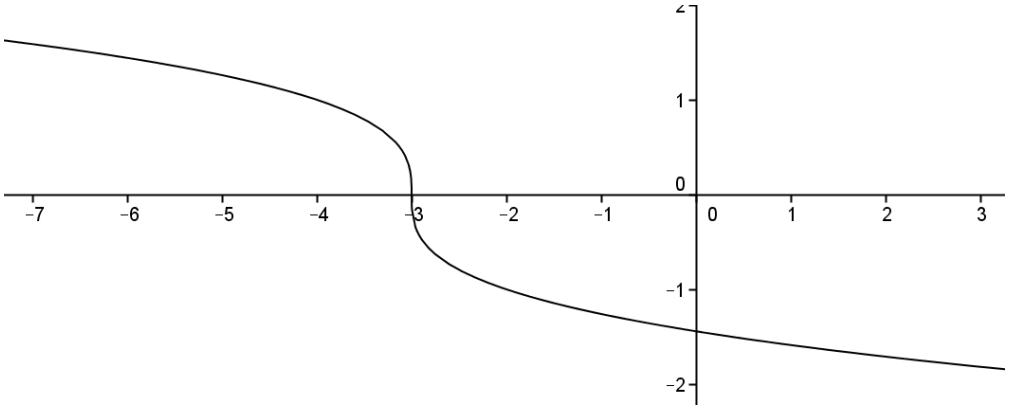
c)



Domain : $(-\infty, \infty)$

Range: $(-\infty, \infty)$

d)

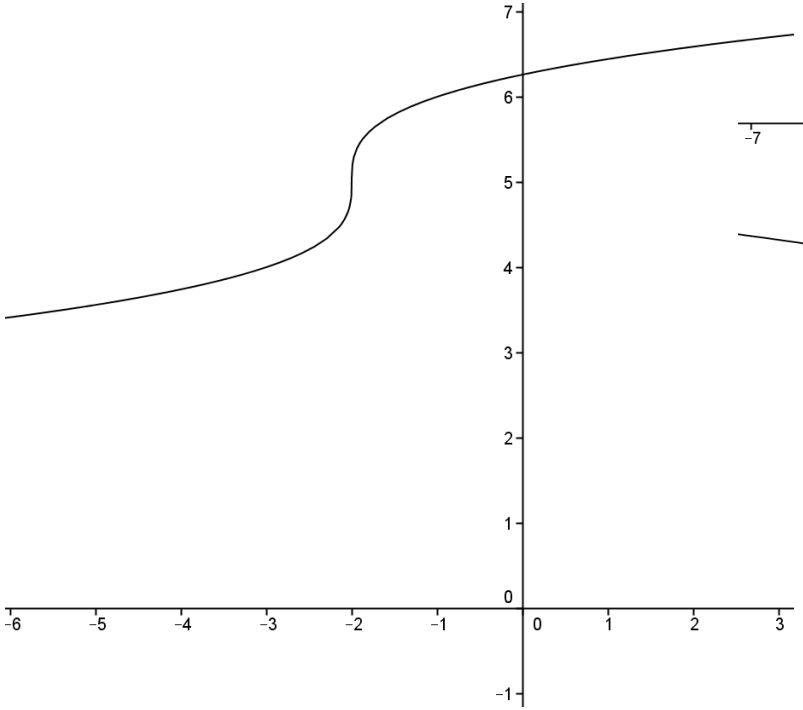


Domain : $(-\infty, \infty)$

Range: $(-\infty, \infty)$

Homework Answers Packet p.4

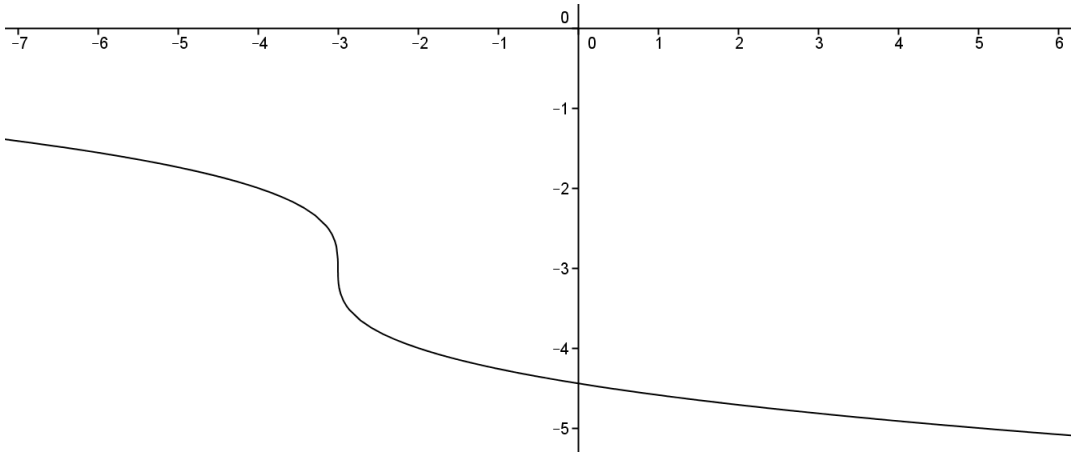
e)



Domain : $(-\infty, \infty)$

Range: $(-\infty, \infty)$

f)



Domain : $(-\infty, \infty)$

Range: $(-\infty, \infty)$

Tonight's Homework

Packet p. 5 odds
(sketch graphs on graph paper!!)

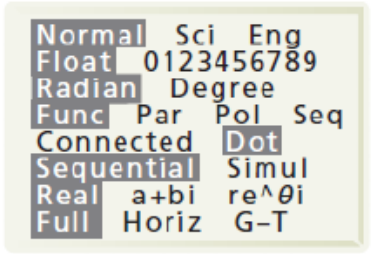
Graphing Inverse Variation

You can use your graphing calculator to graph rational functions. It is sometimes preferable to use the Dot plotting mode rather than the connected plotting mode. The Connected mode can join branches of a graph that should be separated. Try both modes to get the best graph.

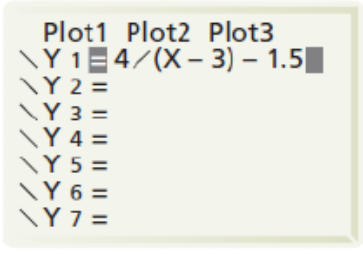
EXAMPLE

Graph $y = \frac{4}{x - 3} - 1.5$.

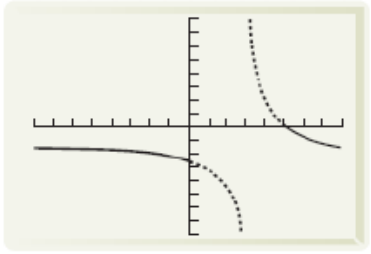
Step 1 Press the MODE key. Scroll down to highlight the word Dot. Then press ENTER.



Step 2 Enter the function. Use parentheses to enter the denominator accurately.



Step 3 Graph the function.



What's happening at x = 3?

at y = -1.5?

Why?

Graphing Discovery On Calc

Notes Pages. 11 #1 – 6

Graph at least 3 points for each branch.

Find the vertical and horizontal asymptotes.

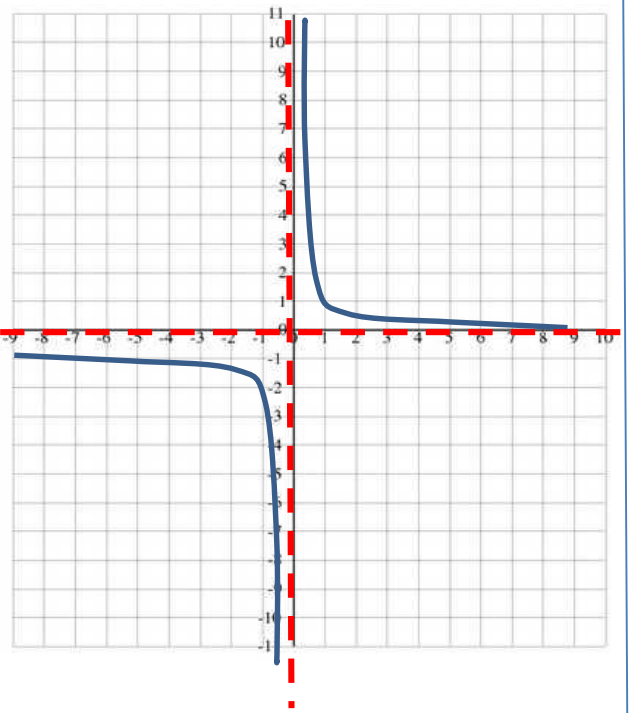
Discuss with your neighbors. ☺

Notes p. 2

1. $y = \frac{2}{x}$

VA: $x = 0$

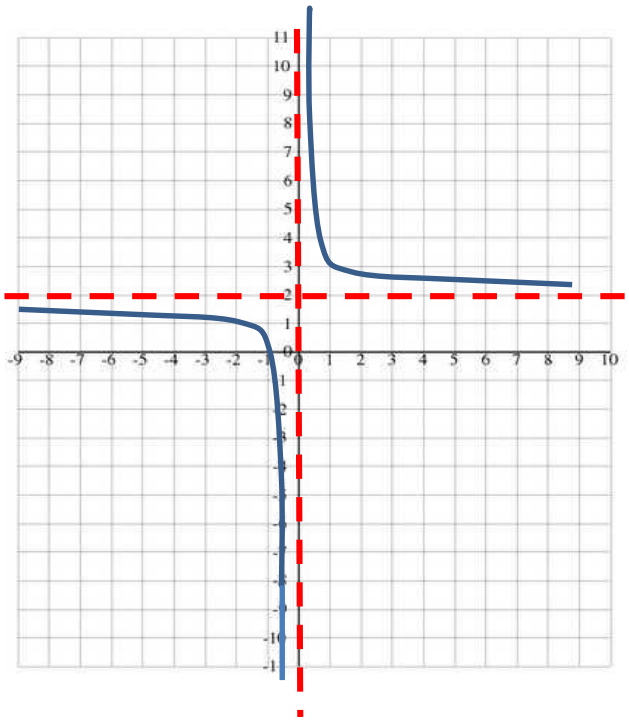
HA: $y = 0$



2. $y = \frac{2}{x} + 2$

VA: $x = 0$

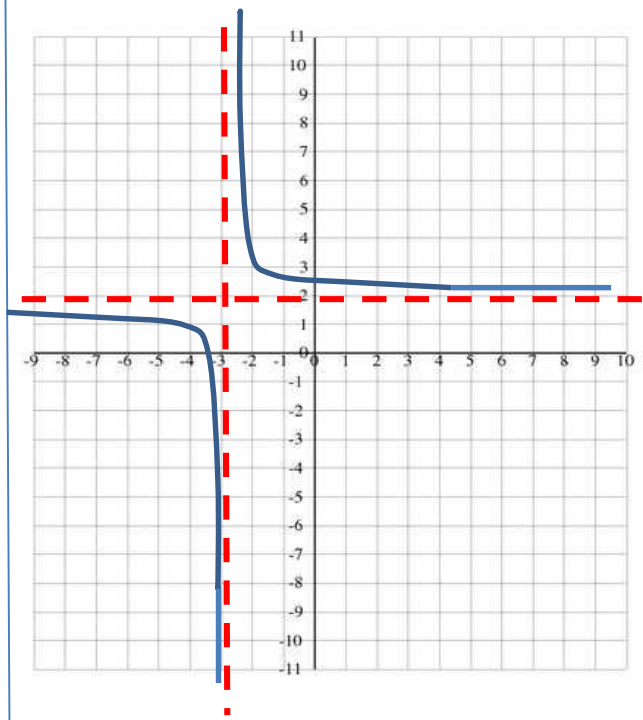
HA: $y = 2$



3. $y = \frac{2}{(x+3)} + 2$

VA: $x = -3$

HA: $y = 2$

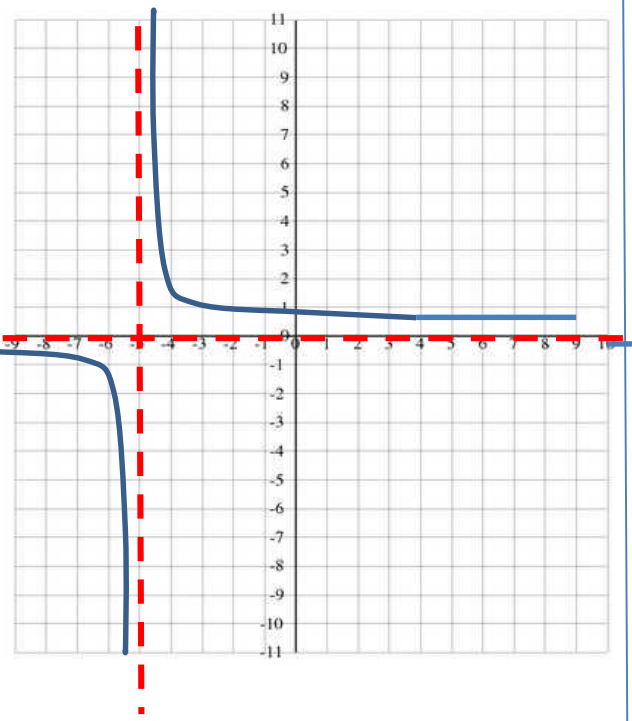


Notes p. 2

4. $y = \dfrac{2}{(x+5)}$

VA: $x = -5$

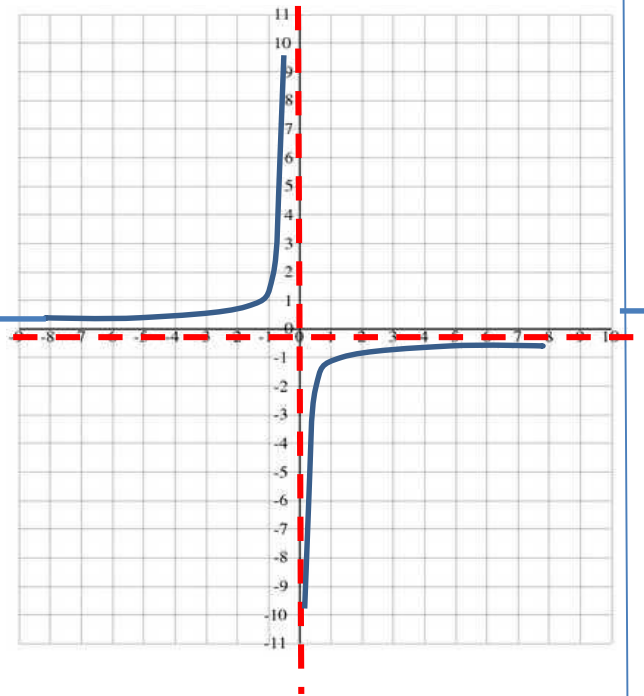
HA: $y = 0$



5. $y = -\dfrac{2}{x}$

VA: $x = 0$

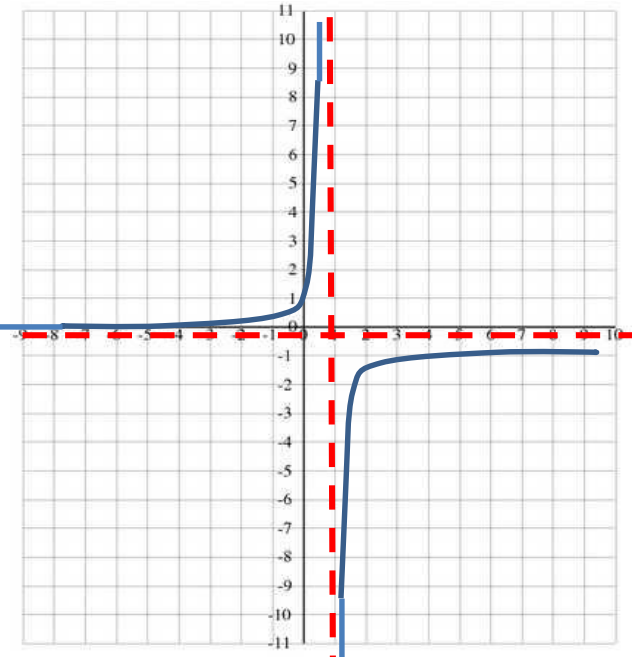
HA: $y = 0$



6. $y = -\dfrac{2}{(x-1)}$

VA: $x = 1$

HA: $y = 0$



Graphing Discovery On Calc

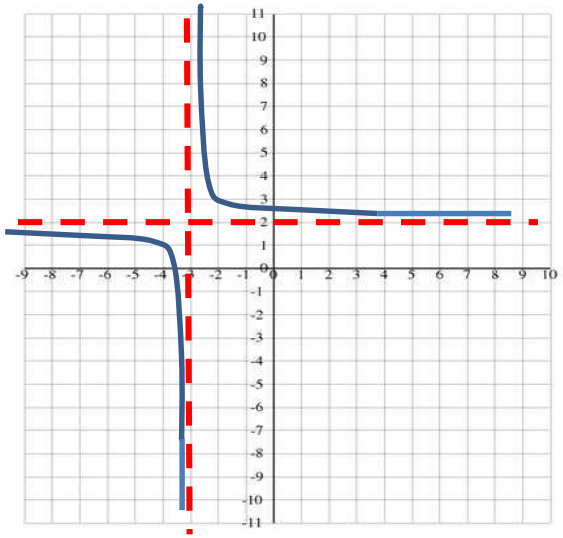
Notes Pages. 11 #1 – 6

Discuss vertical and horizontal asymptotes.

How can we find them using the equation?

The asymptotes of these graphs can help us to write the domain and range. Let's discuss #3, then #4 together.

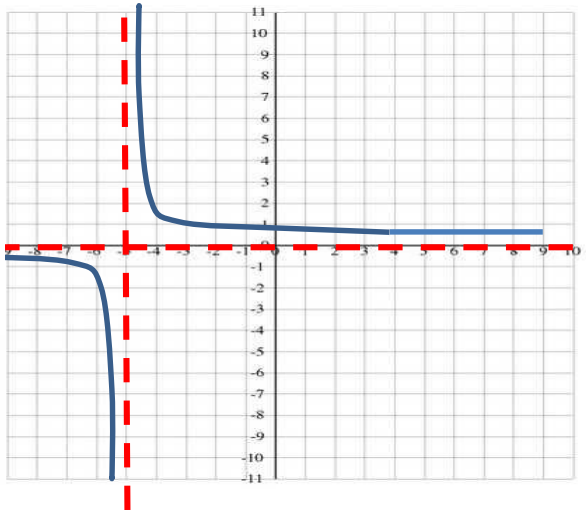
3. $y = \dfrac{2}{(x+3)} + 2$



3) Domain: $(-\infty, -3) \cup (-3, \infty)$

Range: $(-\infty, 2) \cup (2, \infty)$

4. $y = \dfrac{2}{(x+5)}$



4) Domain: $(-\infty, -5) \cup (-5, \infty)$

Range: $(-\infty, 0) \cup (0, \infty)$

You Try #2 and #6

2) Domain: $(-\infty, 0) \cup (0, \infty)$ Range: $(-\infty, 2) \cup (2, \infty)$

6) Domain: $(-\infty, 1) \cup (1, \infty)$ Range: $(-\infty, 0) \cup (0, \infty)$

What is an "inverse variation?"

- A relationship that can be written in the form $y = k/x$, where k is a nonzero constant and $x \neq 0$

- Inverse variation implies that one quantity will increase while the other quantity will decrease (the inverse, or opposite, of increase).

*What are some real life examples of **inverse variation**?

Inverse Variation

Example:

- Suppose that putting on the prom at the certain high school costs $4000.

- How much should you charge per ticket if 100 people will come? 200 people? 400 people?

  $40 $20 $10

- What equation could represent this scenario if we let y represent the cost of a ticket and x be number of tickets sold?

$$y = \frac{4000}{x}$$

You Try!

Example:

- Suppose that hosting a family reunion costs $1000.

- How much should you charge per ticket if 100 people will come? 200 people? 500 people?

  $10 $5 $2

- What equation could represent this scenario if we let y represent the cost of a ticket to the reunion and x represent number of tickets sold? $y = \frac{1000}{x}$

- What is the value of k, the constant?

  k = 1000

How do you graph these by hand? Let's look at $y = \frac{6}{x}$.

First, make a table of values that includes positive and negative values of x.

x	12	6	3	2	1	1/2	0	-1/2	-1	-2	-3	-6	-12
y	.5	1	2	3	6	12	dne	-12	-6	-3	-2	-1	-.5

Graph the points and connect them with a smooth curve.

The graph has two parts.

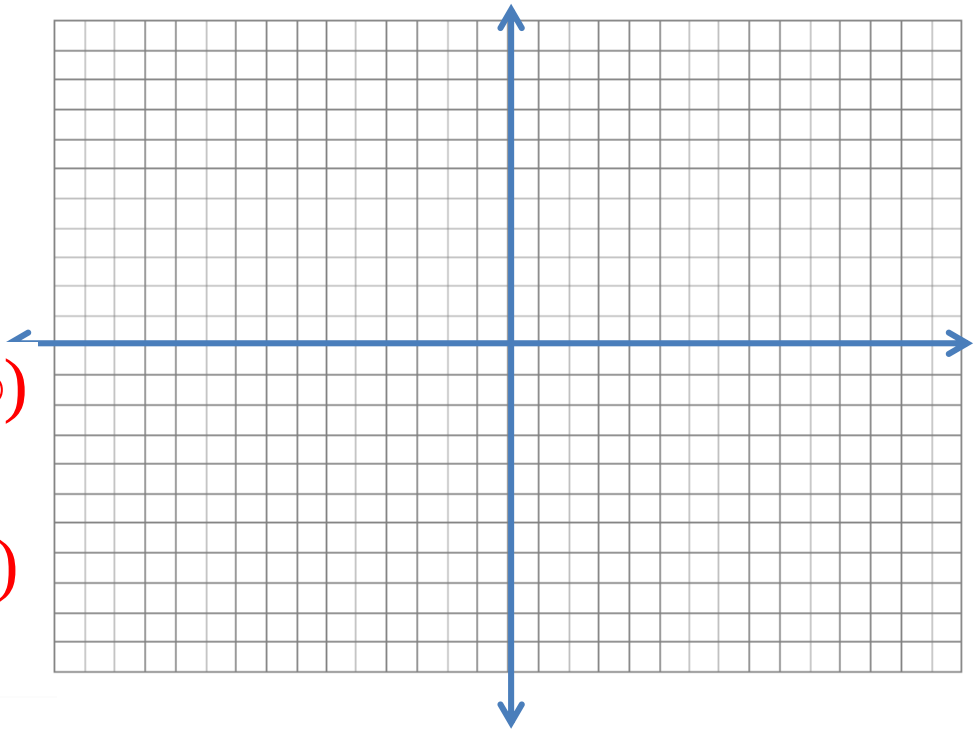
Each part is called a branch.

The x-axis is a horizontal asymptote.

The y-axis is a vertical asymptote.

The Domain of the function is all real numbers except for 0. So $(-\infty, 0) \cup (0, \infty)$

The Range of the function is all real numbers except for 0. So $(-\infty, 0) \cup (0, \infty)$



You try! Graph $y = \frac{12}{x}$ without a calculator.

x	12	6	3	2	1	1/2	0	-1/2	-1	-2	-3	-6	-12
y	1	2	4	6	12	24	dne	-24	-12	-6	-4	-2	-1

Compare this graph to the previous graph.

What are the asymptotes?

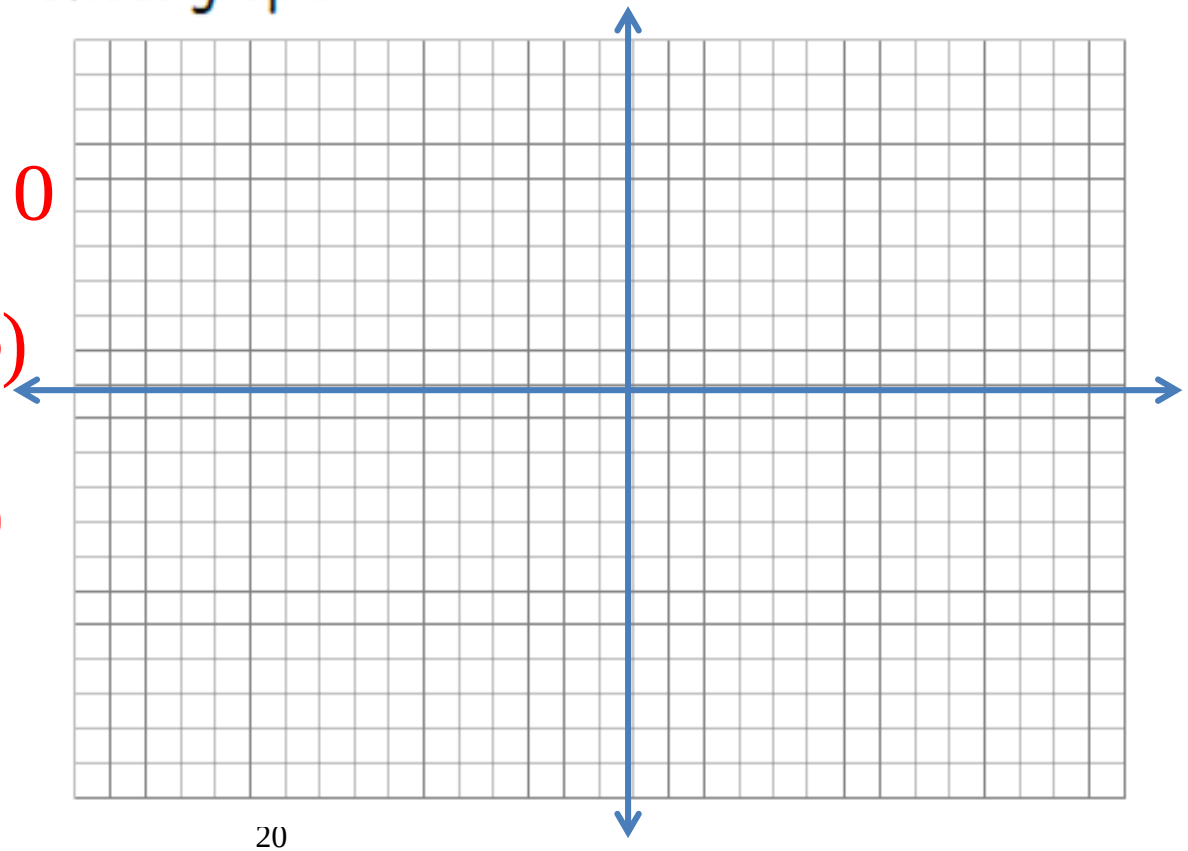
$x = 0 \text{ and } y = 0$

What is the Domain?

$(-\infty, 0) \cup (0, \infty)$

What is the Range?

$(-\infty, 0) \cup (0, \infty)$

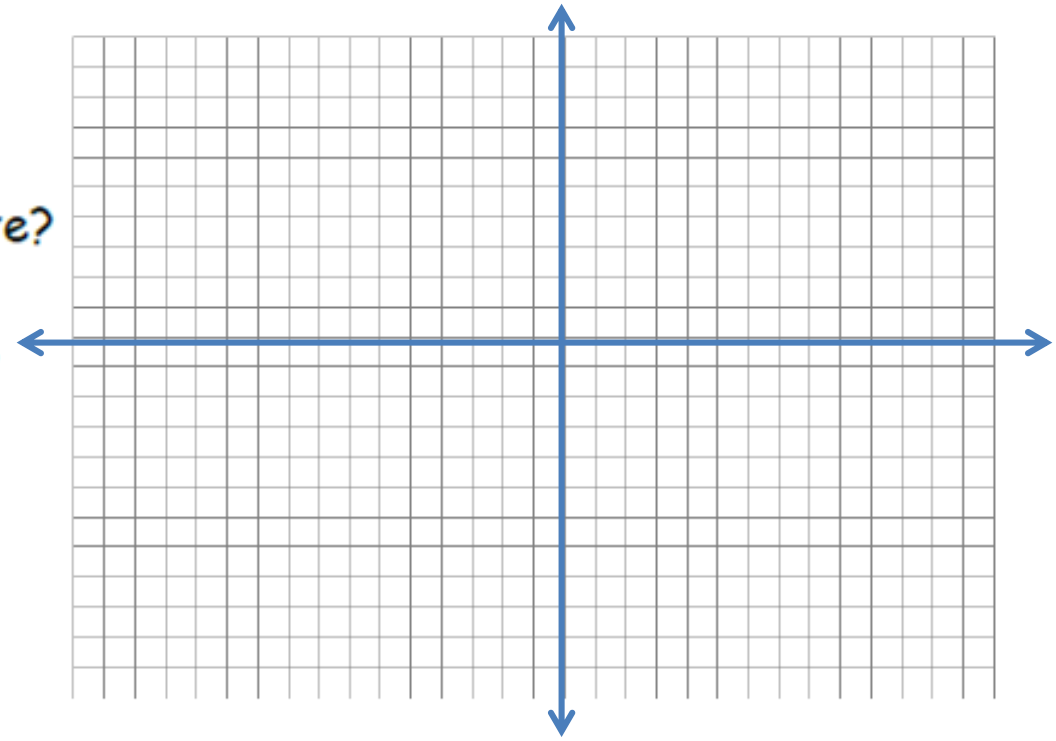


Let's look at

$$y = \frac{6}{(x+3)} + 2.$$

x	9	3	0	-1	-2	-2.5	-3	-3.5	-4	-5	-6	-9	-15
y	2.5	3	4	5	8	14	dne	-10	-4	-1	0	1	1.5

Compare this graph to the previous graphs.



Where is the horizontal asymptote?

$y = 2$

Where is the vertical asymptote?

$x = -3$

What is the Domain?

$(-\infty, -3) \cup (-3, \infty)$

What is the Range?

$(-\infty, 2) \cup (2, \infty)$

Properties: Translations of Inverse Variations

The graph of $y = \frac{k}{x-b} + c$ is a translation of $y = \frac{k}{x}$ by b units horizontally and c units vertically. The vertical asymptote is x = b. The horizontal asymptote is y = c.

Shifting graphs...Write an equation for the translation of $y = \frac{6}{x}$ that has asymptotes at:

Together!

a. x = 4 and y = -3 $y = \frac{6}{x-4} - 3$

You can use "opposite, same" like we did for prior functions ☺

You try!

b. x = -4 and y = 3 $y = \frac{6}{x+4} + 3$

c. x = 0 and y = 2 $y = \frac{6}{x} + 2$

Tonight's Homework

Packet p. 5 odds
(sketch graphs on graph paper!!)