

Graphing Rational Functions (H.A. & V.A.)

Calculators ready ...
 Clear calculator: 2^{nd} $+$ 7 1 2
 Then, 2^{nd} **WINDOW** arrow down to **Indpnt:** and select **ASK**

mode \uparrow
 ANSWERS: DEC



Transformation Form \rightarrow Standard Form of Rational Functions

Find a common denominator and add the rational expressions.

$$f(x) = \frac{-7}{x+5} + \frac{2}{1} \frac{(x+5)}{(x+5)}$$

$$\frac{-7 + 2(x+5)}{x+5} \Rightarrow \frac{-7 + 2x + 10}{x+5} = \frac{2x + 3}{x+5}$$

1. Enter $\frac{2x+3}{x+5}$ into y_1 .

Complete the table below.

| X | Y_1 |
|-----|--------|
| 50 | 1.8727 |
| 75 | 1.9125 |
| 100 | 1.9333 |
| 200 | 1.9659 |
| 300 | 1.977 |

Coefficient

Over

Coefficient

O



What number does the y_1 get very close to? **2**

This number is the horizontal asymptote. As x gets bigger, the y value approaches or gets very close to 2.

Write the equation for the horizontal asymptote.

$$y = 2$$

Do you need to factor the denominator? **NO**
 Set the denominator equal to zero and solve.

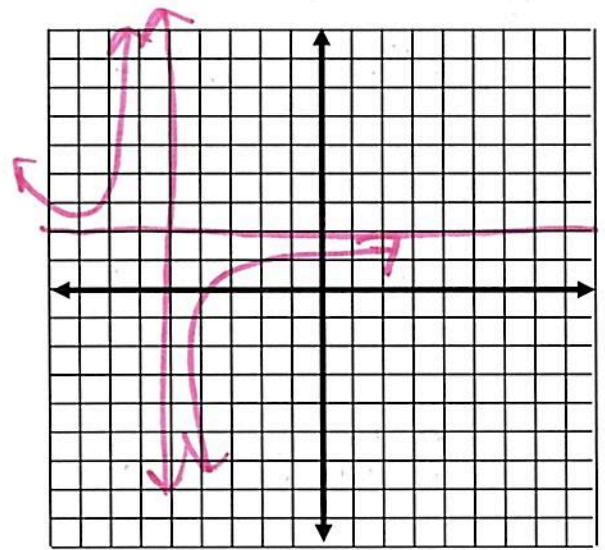
$$x = -5 \quad x + 5 = 0$$

These x values are the vertical asymptotes.
 Write the equation for the vertical asymptotes.

$$x = -5$$

Sketch a graph of the function.

Domain: $\mathbb{R} \mid x \neq -5$ Range: $\mathbb{R} \mid y \neq 2$



2. Enter $\frac{(x-4)}{x^2 + 3x - 10}$ into y_1 .

Bigger
 N
Bottom
 0 zero

Complete the table below.

| X | Y_1 |
|-----|--------|
| 50 | .02045 |
| 75 | .01353 |
| 100 | .01011 |
| 200 | .00503 |
| 300 | .00334 |

What number does the y_1 get very close to? 0



This number is the horizontal asymptote. As x gets bigger, the y value approaches or gets very close to 0.

Write the equation for the horizontal asymptote. $y = 0$

Now factor the denominator.
 Set each factor equal to zero and solve.

$$(x+5)(x-2)$$

$$\begin{aligned} x+5=0 & \quad x-2=0 \\ x=-5 & \quad x=2 \end{aligned}$$

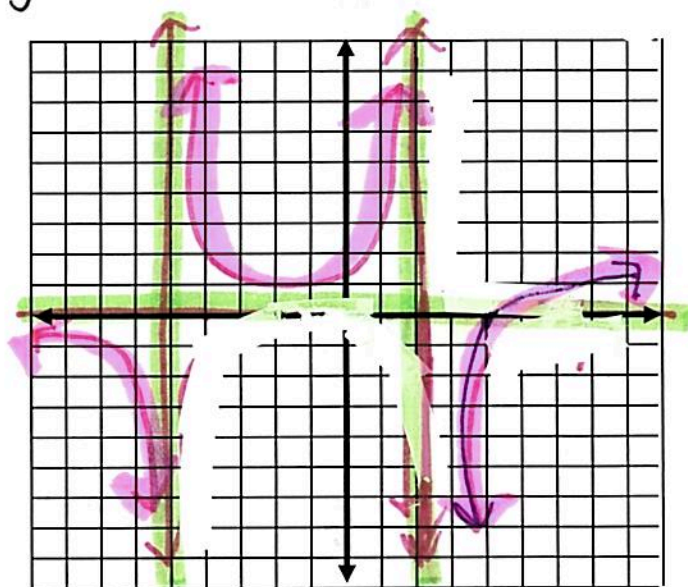
These x values are the vertical asymptotes.
 Write the equation for the vertical asymptotes.

$$x = -5 \quad x = 2$$

Sketch the graph of the function.

Domain: $\mathbb{R} \mid x \neq -5, 2$

Range: $\mathbb{R} \mid y \neq 0$



test $x=0$

$$\frac{-4}{-10} = \frac{4}{10} (+)$$

test $x=3$

$$\frac{-1}{9+6-10}$$

Cross
 x-axis
 at (4, 0)

3. Enter $\frac{2x^2+6x}{x-2}$ into y_1 .

Complete the table below.

| X | Y_1 |
|-----|--------|
| 50 | 110.42 |
| 75 | 160.27 |
| 100 | 210.20 |
| 200 | 410.10 |
| 300 | 610.07 |

Bigger ~~is~~

ON

Top

None



What number does the y_1 get very close to? none

In this case, there is no horizontal asymptote. As x gets bigger, the y value just keeps getting bigger.

Do you need to factor the denominator? NO
Set the denominator equal to zero and solve.

$$x-2=0$$
$$x=2$$

These x values are the vertical asymptotes. Write the equation for the vertical asymptotes.

$$x=2$$

Quick Review Questions:

What do COCO, BOBO & BOTN help you find?

Horizontal Asymptotes

How do you find vertical asymptotes?

Set denominator = 0.

Practice Problems

Given the following rational functions, find the vertical and horizontal asymptotes, domain and range in interval & set notations, and graph.

1. $y = \frac{1}{x+4} + 3$

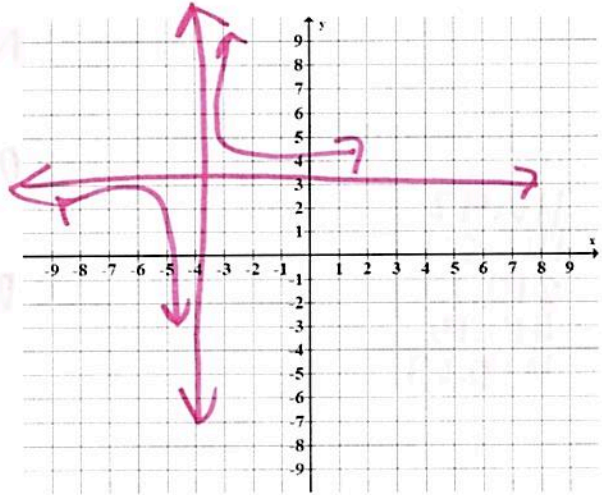
VA: $x = -4$ HA: $y = 3$

Domain

$\mathbb{R} \mid x \neq -4$

Range

$\mathbb{R} \mid y \neq 3$



2. $y = \frac{4x+3}{x-2}$

VA: $x = 2$ HA: $y = 4$

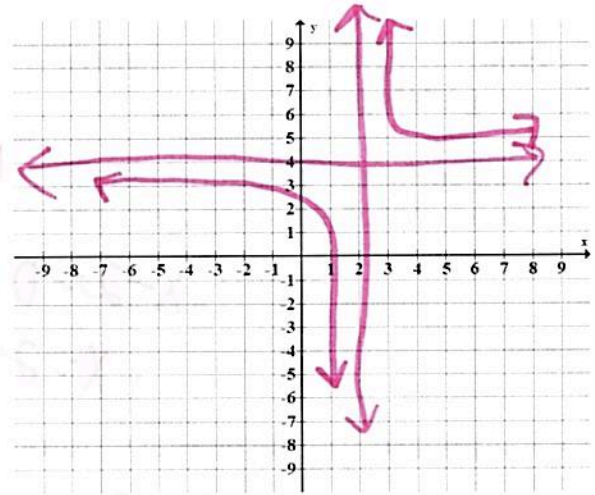
Domain

$\mathbb{R} \mid x \neq 2$

Range

$\mathbb{R} \mid y \neq 4$

test $x = 0$
 $y = -3/2$



3. $y = \frac{1}{x^2+2x-8}$

VA: $x = -4, 2$ HA: $y = 0$

Domain

$\mathbb{R} \mid x \neq -4, 2$ $(x+4)(x-2)$

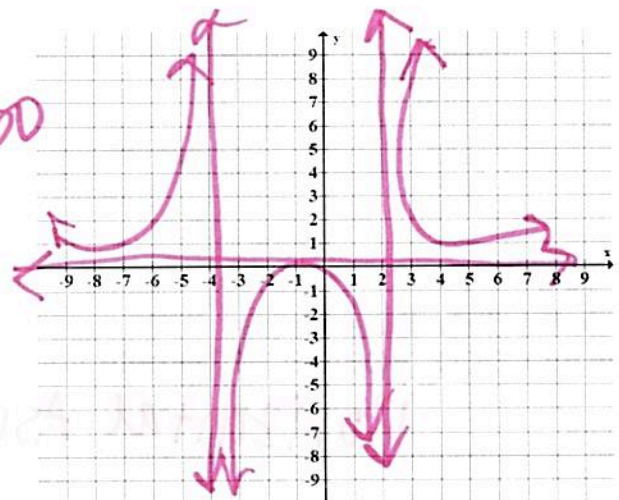
Range

$\mathbb{R} \mid y \neq 0$

4. $y = \frac{x^2+3x+2}{x+4}$ $\frac{(x+2)(x+1)}{x+4}$

VA: $x = -4$ HA: none

BOTN



PAP Algebra 2
8.3 Evaluate Graphing Rational Functions

Name: _____

Graph the function with a solid line and the asymptotes with a dashed line.

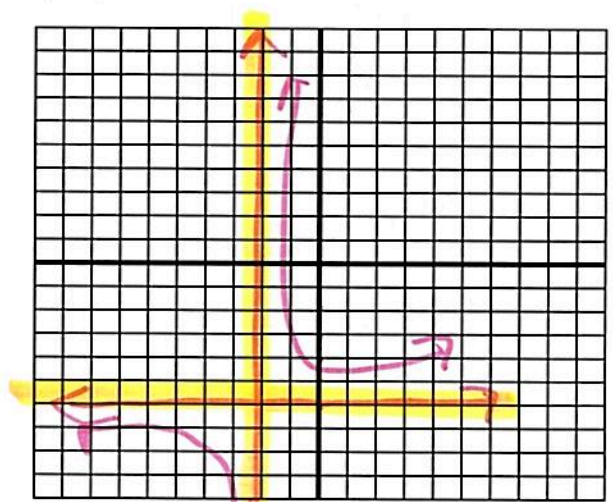
1. $f(x) = \frac{-6x + 5}{x + 2}$ *COLO test 0*

VA: $x = -2$

HA: $y = -6$

Domain: $\mathbb{R} \mid x \neq -2$

Range: $\mathbb{R} \mid y \neq -6$



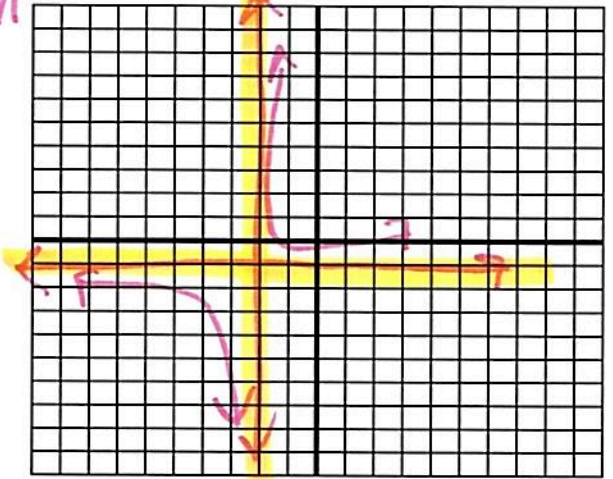
2. $f(x) = \frac{1}{x + 2} - 1$ *transformation form*

VA: $x = -2$

HA: $y = -1$

Domain: $\mathbb{R} \mid x \neq -2$

Range: $\mathbb{R} \mid y \neq -1$



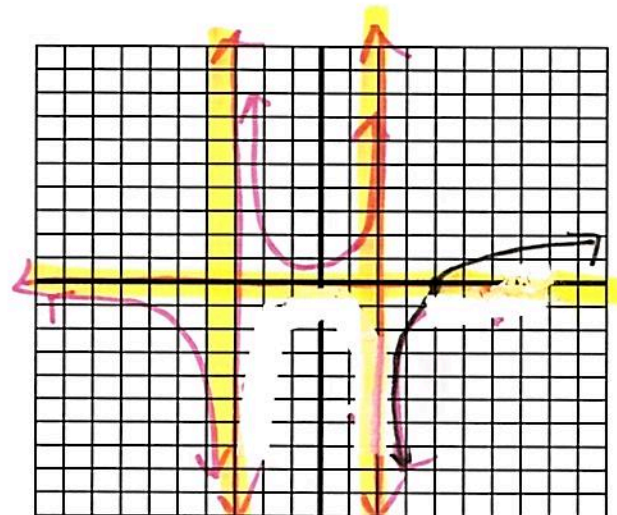
3. $f(x) = \frac{x - 4}{x^2 + x - 6}$ *BOBBO*
 $(x + 3)(x - 2)$

VA: $x = -3, 2$

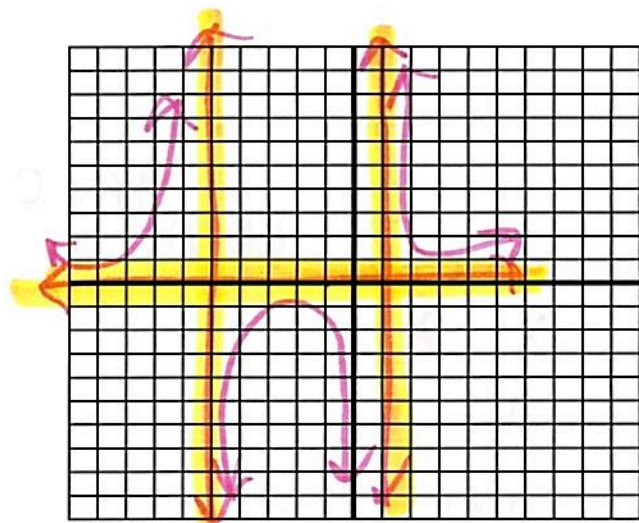
HA: $y = 0$

Domain: $\mathbb{R} \mid x \neq -3, 2$

Range: $\mathbb{R} \mid y \neq 0$



4. $f(x) = \frac{4}{x^2 + 4x - 5}$ *BOBOO*
 $(x+5)(x-1)$
 VA: $x = -5$ $x = 1$
 HA: $y = 0$
 Domain: $\mathbb{R} \mid x \neq -5, 1$
 Range: $\mathbb{R} \mid y \neq 0$



State the equations of the vertical and horizontal asymptotes for each rational function.

5. $f(x) = \frac{8x}{x-4}$

VA: $x = 4$

HA: $y = 8$
COCO

7. $f(x) = \frac{x^2 + x - 6}{x-4}$

VA: $x = 4$

HA: *none*
BOTN

6. $f(x) = \frac{x^2 - 3}{x+6}$

VA: $x = -6$

HA: ~~$y = 0$~~ *none*
BOTN

8. $f(x) = \frac{1}{x-9}$

VA: $x = 9$

HA: $y = 0$
BOBOO