

Warmup:

Graph the function below:

$$\frac{x+1}{x^2+x-6}$$

$$\frac{x+1}{(x+3)(x-2)}$$

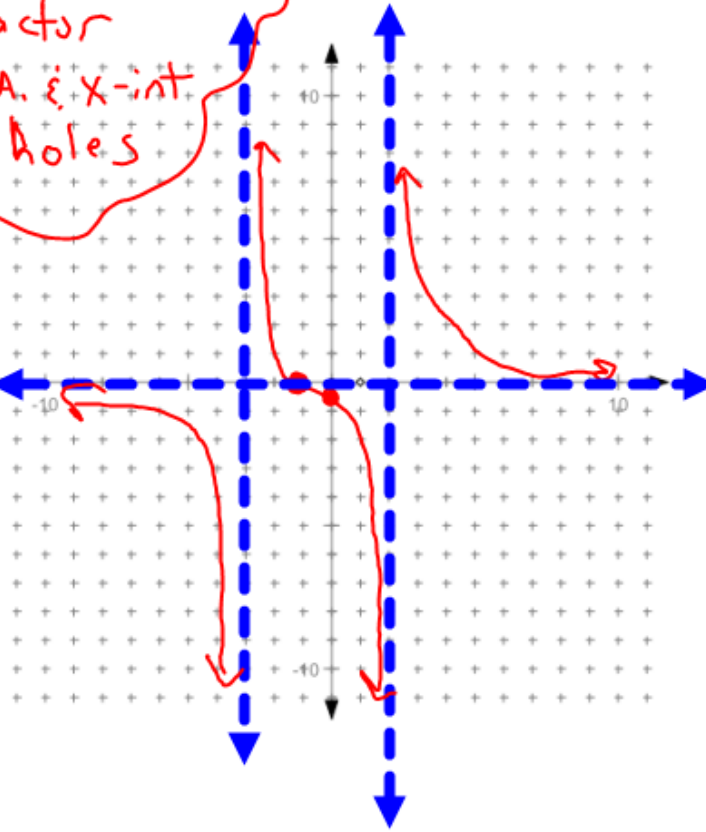
$$\text{H.A. } y=0$$

$$y\text{-int} = -\frac{1}{6}$$

$$\text{V.A. } x=-3 \quad x=2$$

$$x\text{-int: } x=-1$$

- (1) H.A. & y-int
- (2) Factor
- (3) V.A. & x-int & holes



Horizontal

$$\frac{2x + 4}{3x - 1}$$

$$3x - 1$$

H.A.

$$y = \frac{2}{3} \text{ or } .67$$

Asymptote

$$\frac{x + 4}{x^2 + 3x - 6}$$

$$x^2 + 3x - 6$$

H.A.

$$y = 0$$

$$\frac{x^2 + 3x - 6}{x + 4}$$

$$x + 4$$

Slant Asymptote

$$y =$$

No H.A.

Slant Asymptotes

Slant Asymptote: an asymptote that is a line but is neither vertical nor horizontal.

- If the degree of the numerator is exactly one more than the denominator, then there exists a slant (oblique) asymptote.
- There will be only 0 or 1 horizontal or slant asymptote for rational functions

To find the SA of a rational function:

1. Use long division or synthetic division if the denominator is a linear binomial
2. The slant asymptote is the quotient without the remainder
3. Your answer should be $y =$ quotient (without the remainder)

★ Ignore the REMAINDER ★

Example 1: Find the SA

a) $f(x) = \frac{x^2 - x}{x+1}$ $x+1=0$
 $x=-1$

$$\begin{array}{r} -1 \overline{) 1 \quad -1 \quad 0} \\ \underline{1 \quad -1} \\ 0 \end{array}$$

remainder

1 -2
linear constant

S.A. $y = x - 2$

b) $f(x) = \frac{x^2 + 3x + 1}{x - 2}$

$$\begin{array}{r} 2 \overline{) 1 \quad 3 \quad 1} \\ \underline{2 \quad -4} \\ 1 \quad 5 \end{array}$$

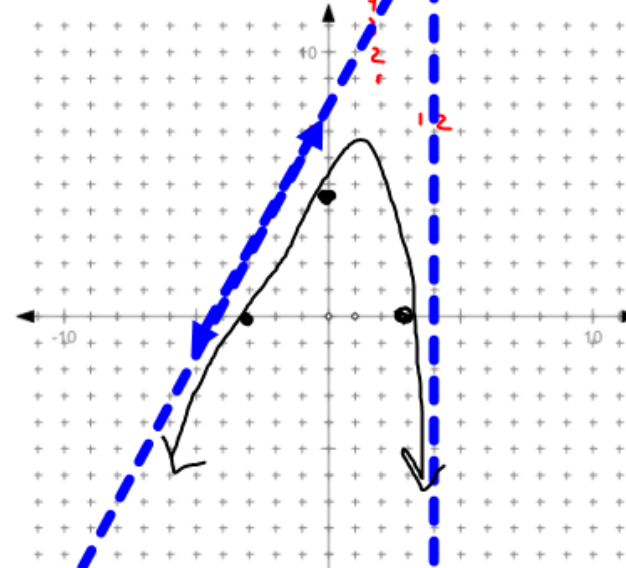
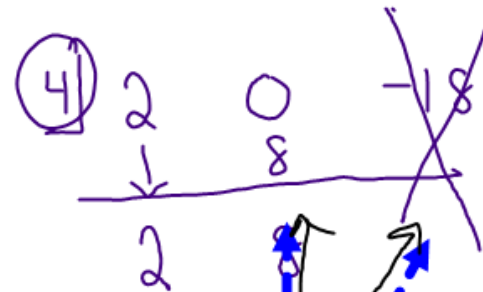
S.A: $y = x + 5$

Find the ~~domain~~, VA, HA or SA, HA or SA intersection (if it exists), and intercepts for the rational function.

$$f(x) = \frac{2x^2 - 18}{x - 4} = \frac{2(x+3)(x-3)}{x-4}$$

~~D~~: _____
 VA: $x=4$
 HA: None
 SA: $y=2x+8$

Intercepts: x-int: 3 & -3
 y-int: 4.5



Graphing Rational Functions:

To graph rational functions:

1. Find all characteristics (VA, HA or SA, holes, and intercepts)
2. Graph all important characteristics
3. Use a t-chart to find additional points to show what the graph does on each side of and in between each VA

$$a) f(x) = \frac{x^2+2x+1}{x-1} = \frac{(x+1)(x+1)}{x-1}$$

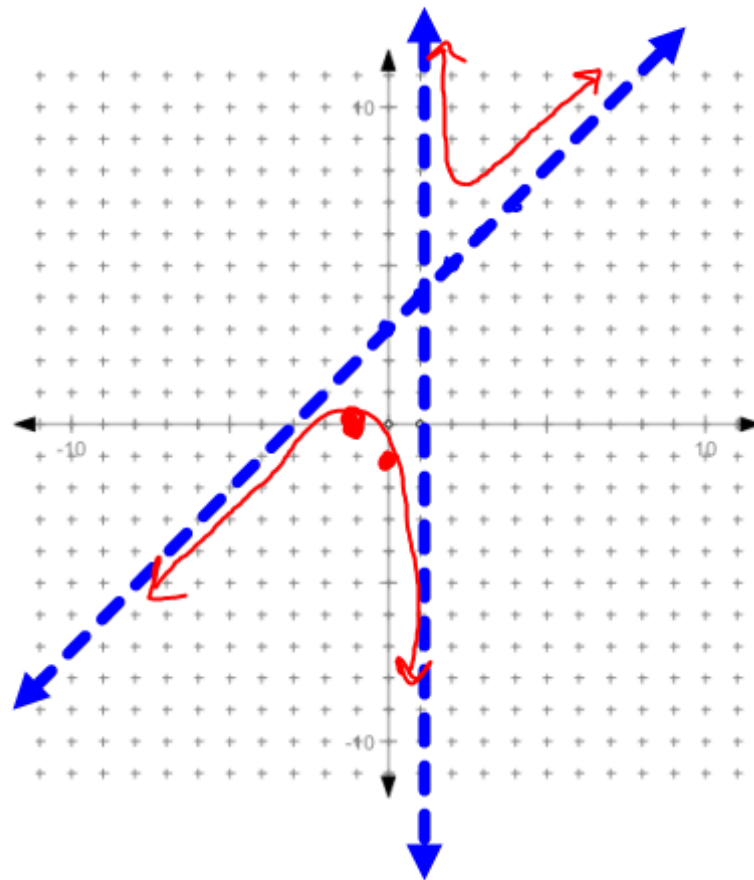
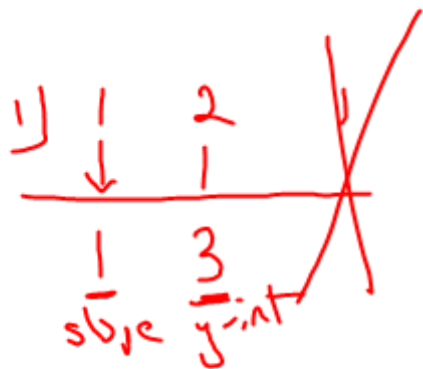
~~_____~~

* VA: $x=1$

• HA: None

• SA: $y = x + 3$

Intercepts: y-int: -1
x-int: -1



$$b) f(x) = \frac{x^2 + 2x + 1}{x + 2} \quad \frac{(x+1)(x+1)}{x+2}$$

~~Domain:~~

$$\rightarrow VA: x = -2$$

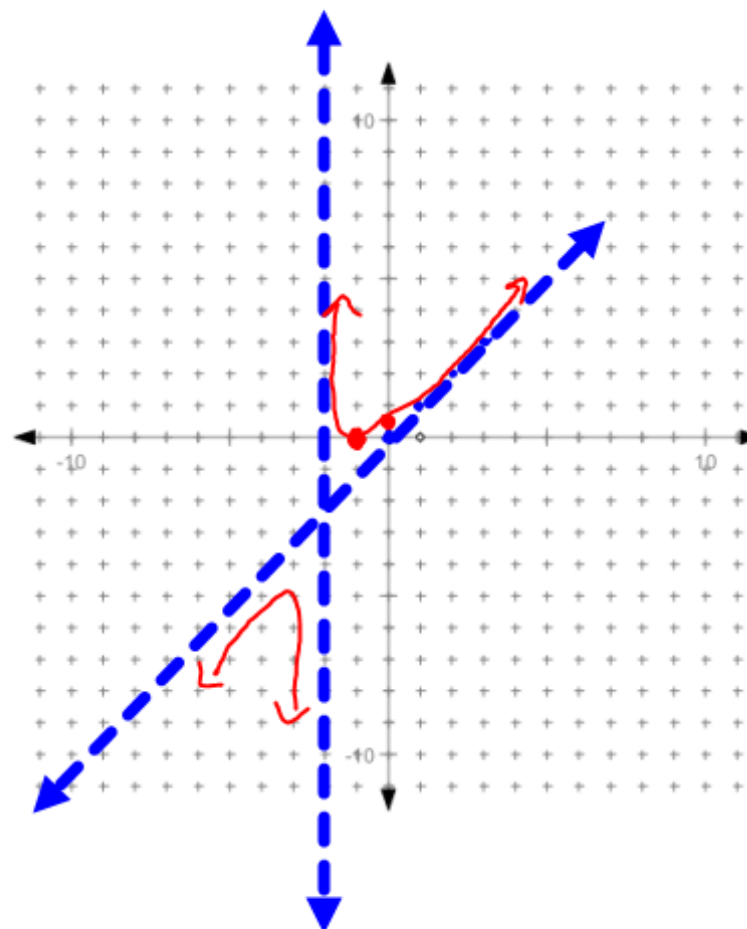
HA: N/A

$$\rightarrow SA: y = x \quad y = x + 0$$

Intercepts: y-int: $\frac{1}{2}$

x-int: -1

$$y = mx + b$$



c) $f(x) = \frac{x-1}{x^2-4}$

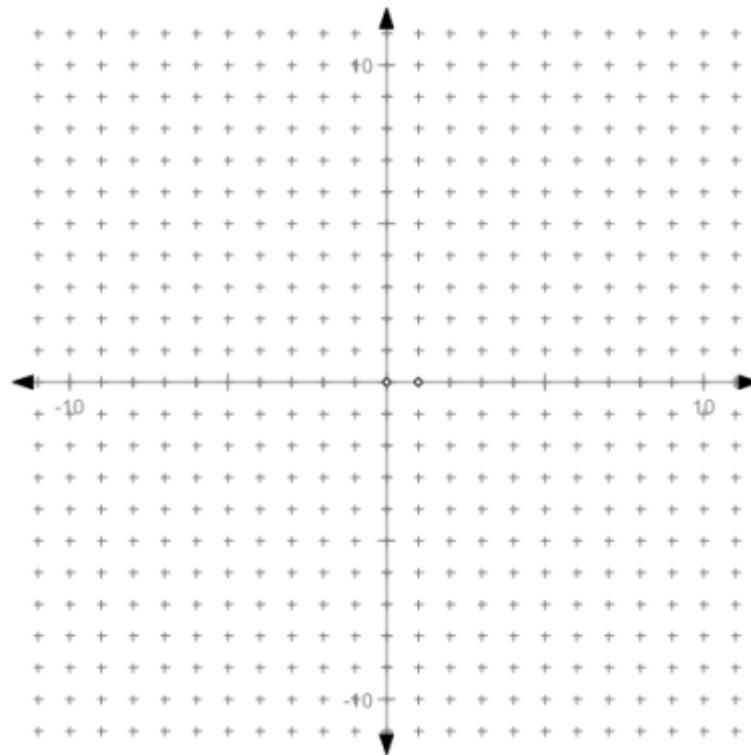
Domain:

VA:

HA:

SA:

Intercepts:



$$d) f(x) = \frac{2x+1}{x^2-9}$$

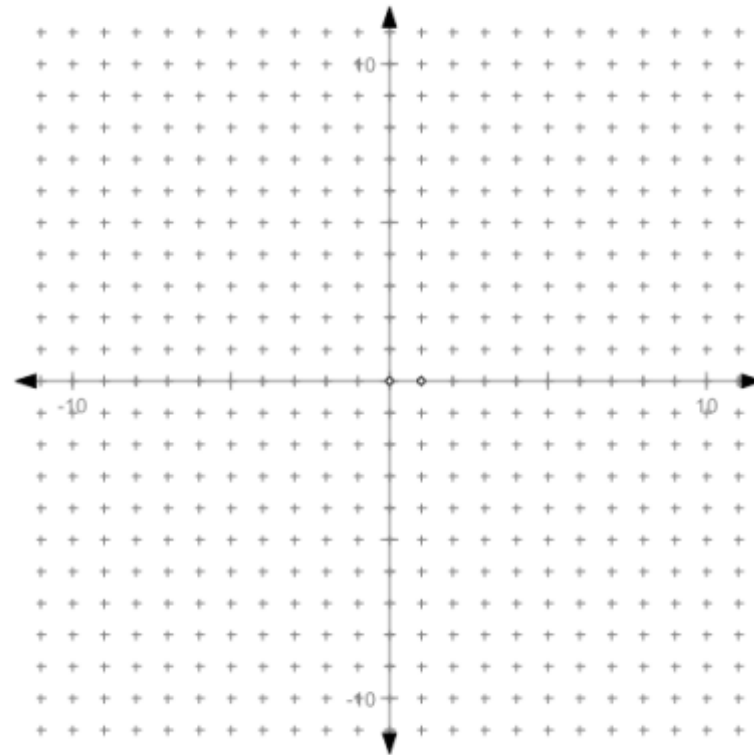
Domain:

VA:

HA:

SA:

Intercepts:



Homework:

Graphing Rational Functions Worksheet #2

