

Introduction to Graphing Rational Functions

Find any Vertical Asymptotes, Holes, and Horizontal Asymptotes

$$\frac{(x+2)(x+2)}{x^2 + 2x + 2x + 4}$$

$$a) f(x) = \frac{2x+1}{x+3}$$

$$\text{H.A.: } y = 2$$

No Holes:

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

$$x+3=0$$

$$x = -3$$

$$b) f(x) = \frac{(x^2-4)}{x^2+3x-18} = \frac{(x-2)(x+2)}{(x+6)(x-3)} \quad c) f(x) = \frac{x+5}{x^2+4}$$

$$\text{H.A.: } y = 1$$

No Holes

$$\text{V.A.: } x = -6 \quad x = 3$$

$$x+6=0$$

$$x-3=0$$

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

No Holes

V.A.: None

$$x^2+4=0$$

$$\sqrt{x^2} = \sqrt{-4}$$

No real solutions

Intercepts of a Rational Function:

- Intercepts are the points where the graph crosses the x-axis and the y-axis

To find x-Intercepts or Zeros (0 or several x-intercepts):

- Set the numerator equal to 0
- Solve
- Write your answer as the point: (____, 0)

To find the y-Intercept (there can either be 0 or 1):

- Plug in 0 for x
- Evaluate for y
- Write your answer as the point: (0, _____)

No y-int

$$a) f(x) = \frac{(2x+1)}{3x+0}$$

$$x\text{-int: } 2x+1=0 \quad (-.5, 0)$$

$$2x = -1$$

$$x = -\frac{1}{2} \text{ or } -.5$$

$$y\text{-int: } \frac{0+1}{0} = \frac{1}{0} = \text{undefined}$$

$$b) f(x) = \frac{(x^2-9)}{2x^2+5x+4}$$

$$y\text{-int: } \frac{0-9}{0+0+4} = \frac{-9}{4}$$

$$x\text{-int: } x^2-9=0$$

$$\sqrt{x^2} = \sqrt{9}$$

$$x = 3 \text{ or } -3$$

$$y\text{-int: } (0, -2.25)$$

$$x\text{-int: } (-3, 0)$$

$$(3, 0)$$

+4

Find the VA, HA, holes (if any), x and y intercepts:
Factor your function first!!

$$a) f(x) = \frac{\cancel{(x+2)}(x+1)}{x^2+3x+2}$$

- #1) HA & y-int
#2) Factor/Holes
#3) VA & x-int

VA: None
HA: None
x-Int: -1
y-Int: +1
Holes: $(-2, -1)$

$$f(x) = x+1$$

$$= -2+1$$

$$= -1$$

$$\frac{\cancel{(x+2)}(x+1)}{\cancel{x+2}}$$

$$x+1=0$$

$$x=-1$$

$$f(x) = x+1$$

$$-2+1 = -1$$

$\frac{0}{-1}$

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

VA: $x=-1$ $x=1$
HA: $y=3$
x-Int: 0
y-Int: 0
Holes: No holes

$$\frac{3x^2}{3} = \frac{0}{3}$$

$$\sqrt{x^2} = \sqrt{0}$$

$$x = 0$$

$$c) f(x) = \frac{x+1}{x^2+6x-16}$$

$$= \frac{x+1}{(x+8)(x-2)}$$

use to find
holes & V.A.

VA: $x = -8$ $x = +2$

HA: $y = 0$

x-Int: -1

y-Int: $-\frac{1}{16}$

Holes: None

use to

find

H.A.

& y-int

$$x+1=0$$

use to find
x-int

$$x = -1$$

Graphing Rational Functions

Graphing Rational Functions:

- Find and graph the VA and HA
- Find and graph the x and y Intercepts and any holes (if any)
- Use a chart to evaluate additional points to show what the graph does on each section of graph (using your VA to split into sections)

Parent Function:

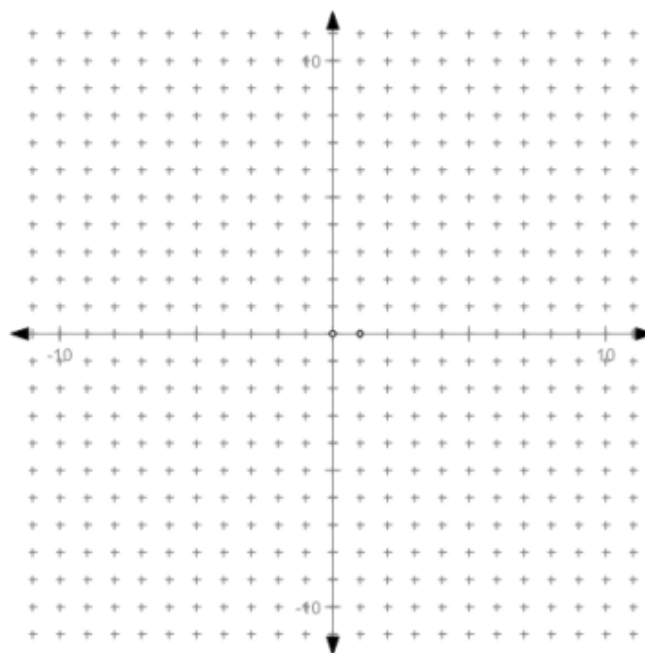
$$f(x) = \frac{1}{x}$$

VA:

HA:

Holes:

Intercepts:



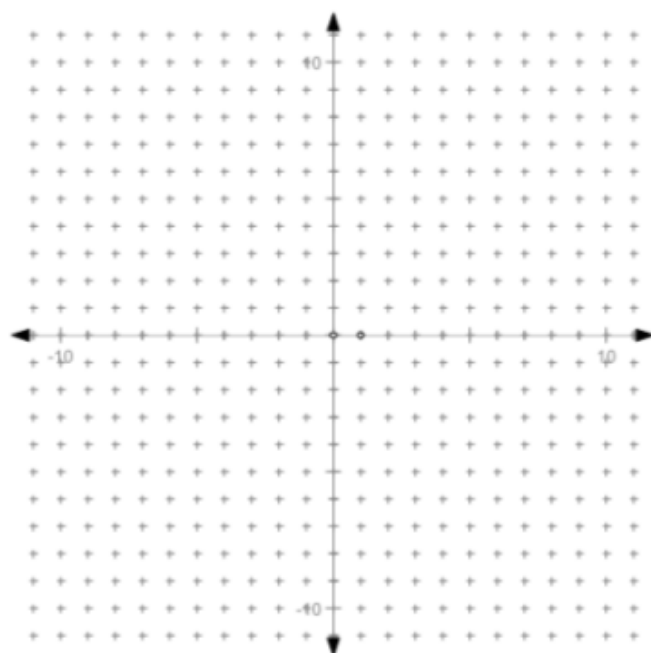
$$a) f(x) = \frac{2x-1}{x-3}$$

VA:

HA:

Holes:

Intercepts:



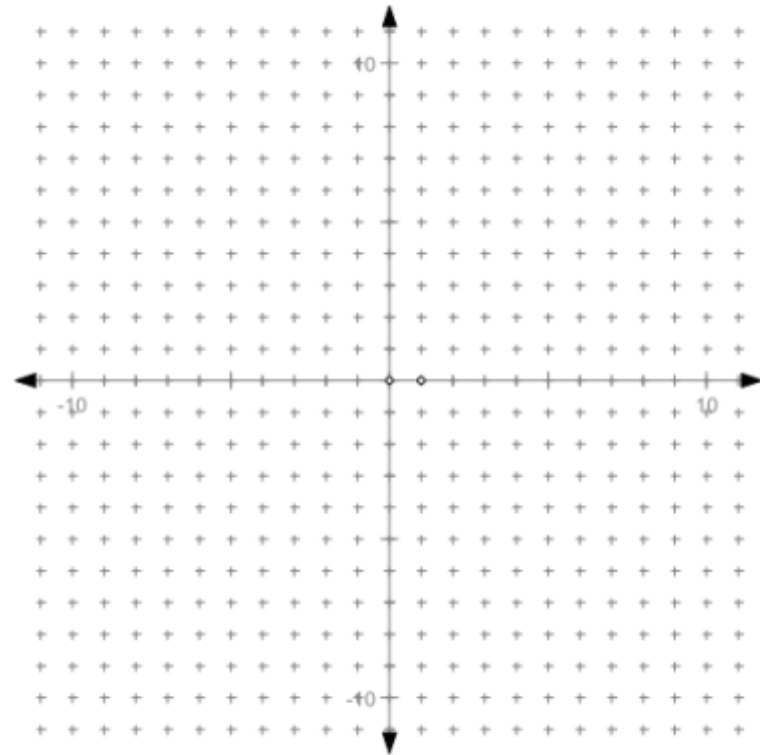
$$b) f(x) = \frac{2x^2 - 18}{x^2 - 4}$$

VA:

HA:

Holes:

Intercepts:



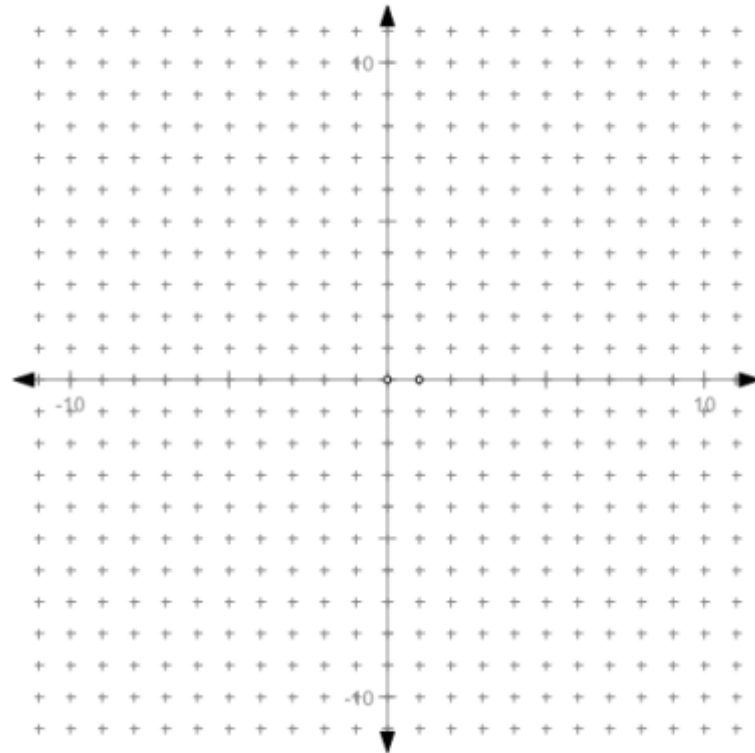
$$c) f(x) = \frac{2x-4}{x-1}$$

VA:

HA:

Holes:

Intercepts:



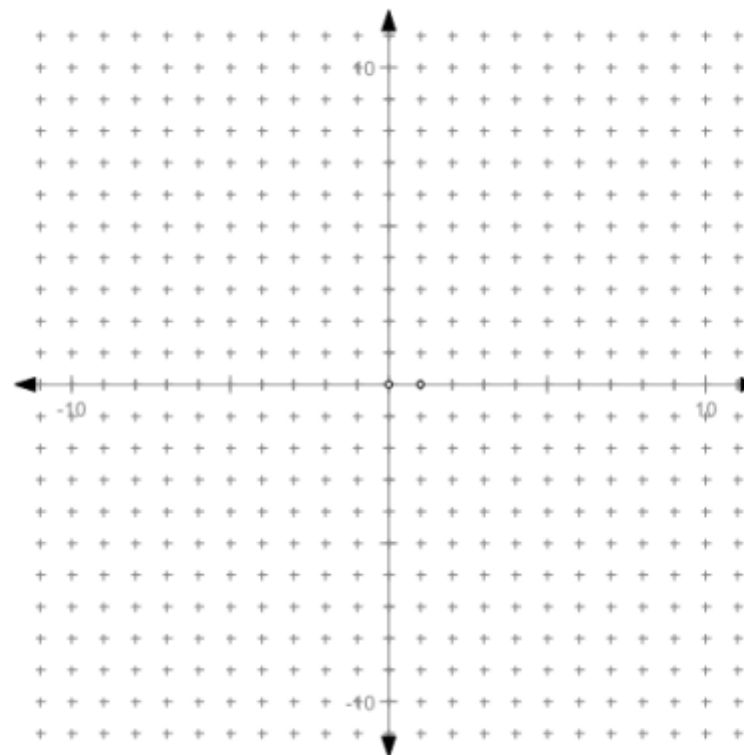
$$d) f(x) = \frac{2x^2 - 8}{x^2 - 3x + 2}$$

VA:

HA:

Holes:

Intercepts:



Homework:

Graphing
Rational
Functions
Worksheet #1