87)

1	1	3	-2	1
	↓	1	4	2
	1	4	2	3

upper bound

-4	1	3	-2	1
	↓	-4	4	-8
	1	-1	2	-7

lower bound

41) $1, 5i, -5i$

$f(x) = a(x-1)(x-5i)(x+5i)$

$x^2 + 5xi - 5xi - 25i^2$

$a = 1$

$f(x) = (x-1)(x^2+25)$

$f(x) = x^3 - x^2 + 25x - 25$

71) $g(x) = x^4 - 4x^3 + 8x^2 - 16x + 16$ $\quad \pm 1, 2, 4, 8, 16$

$$\begin{array}{r|rrrrr} 2 & 1 & -4 & 8 & -16 & 16 \\ & \downarrow & 2 & -4 & 8 & -16 \\ \hline 2 & 1 & -2 & 4 & -8 & 0 \\ & \downarrow & 2 & 0 & 8 & \\ \hline & 1 & 0 & 4 & 0 & \end{array}$$

$g(x) = (x-2)^2(x-2i)(x+2i)$

$x^2 + 4 = 0$

$x = \pm 2i$

Section 2.6A

Rational Functions

Guidelines for Analyzing graphs of Rational Functions.

1. Simplify $f(x)$: FACTOR
2. Find the Holes (if any)
3. Find the Asymptotes
   a) vertical
   b) horizontal
   c) slant, parabolic, etc.
4. Find the Zeros
5. Find the y-intercept
6. Find the domain and range

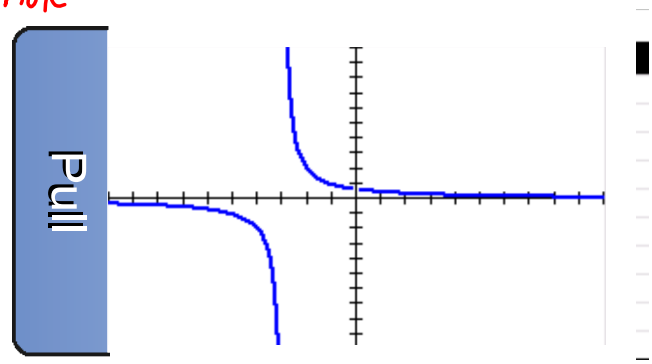
Determine if the given Rational Function has any holes.

Hole: same factor in the numerator and denominator

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

$x=0$ @ hole

$\left(0, \frac{2}{3}\right)$



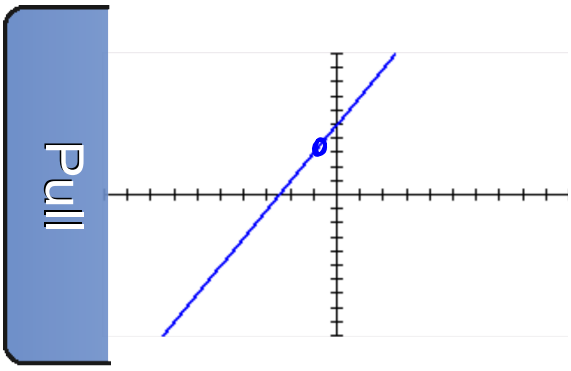
Determine if the given Rational Function has any holes.

$$f(x)=\frac{\overbrace{2x^2+7x+5}^{(2x+5)\cancel{(x+1)}}}{\cancel{(x+1)}} = 2x+5$$

hole @ $(x+1)=0$

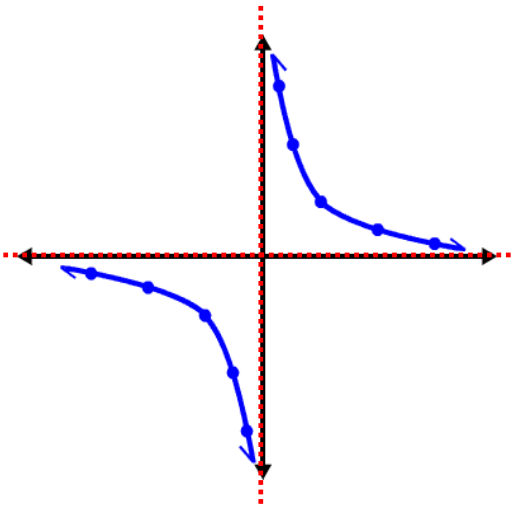
$x=-1$

$(-1, 3)$

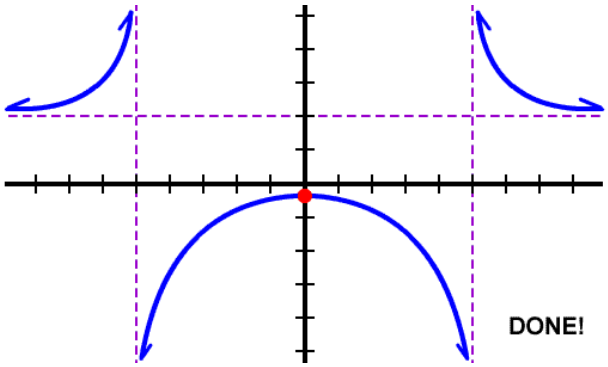


X	Y1
-5	-5
-4	-3
-3	-1
-2	1
-1	ERROR
0	5
1	7
2	9
3	11
4	13
5	15

How do you find asymptotes?

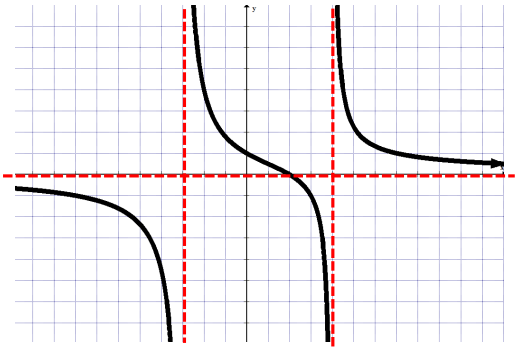


$$y = \frac{1}{x}$$



$$y = \frac{2x^2 + 10}{x^2 - 25}$$

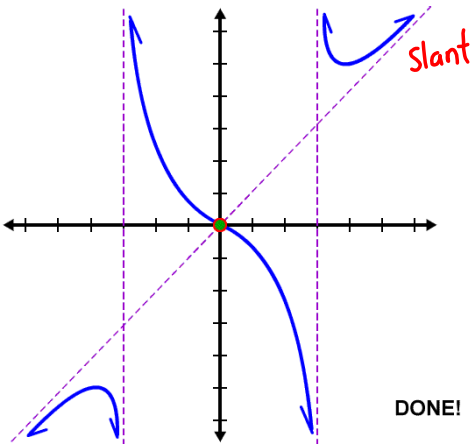
$(x+5)(x-5)$



$6(x-2)$

$$y = \frac{6x - 12}{x^2 - x - 12}$$

$(x-4)(x+3)$



$$y = \frac{x^3}{x^2 - 9}$$

$(x+3)(x-3)$

Asymptotes

vertical asymptotes:

Set the factors of the denominator = 0, then solve for x

horizontal asymptotes: think of end behavior

Think about large values of x, what line do the answers approach?

Compare the degree & leading coefficient of the numerator and denominator:

$$f(x)=\frac{nx^{a}\ldots}{mx^{b}\ldots}$$

a) a < b, y = 0

b) a = b, y = n/m (ratio of leading coefficients)

c) a > b, y = higher degree polynomial

Graph each equation and answer the following information as it applies.

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

$(x+2)(x+1)$

Domain $\mathbb{R}, x \neq -2, -1$

Holes None

VA: $x = -2, -1$

HA: $y = 0$

x-int $(-\frac{1}{3}, 0)$

y-int $(0, \frac{1}{2})$

x-int: Let y=0 & solve

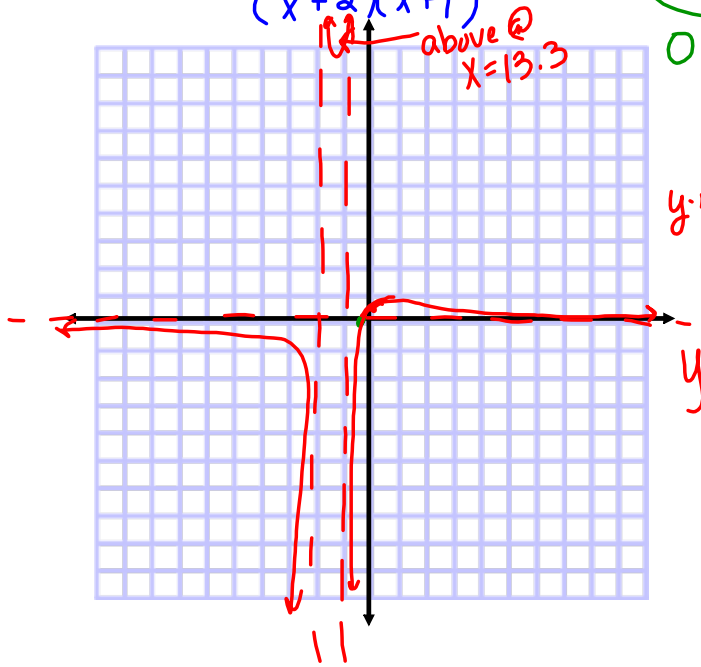
$\frac{0}{1} = \frac{3x+1}{x^2+3x+2}$

$0 = 3x+1$

$x = -1/3$

y-int: Let x=0 & solve

$y = \frac{0+1}{0+0+2} = \frac{1}{2}$



Graph each equation and answer the following information as it applies.

Domain $\mathbb{R}, x \neq -1, 5$

Holes $(5, 5/3)$

VA $x = -1$

HA $y = 1$

x-int $(-5, 0)$

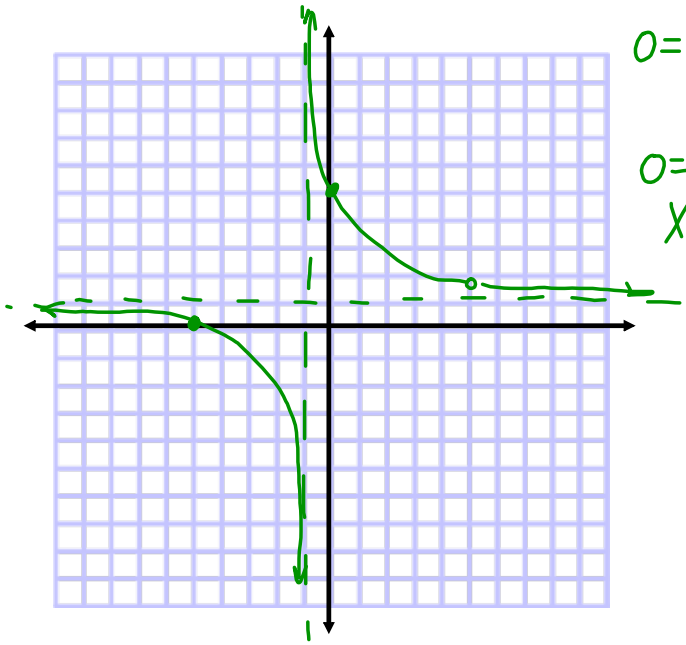
y-int $(0, 5)$

$$y = \frac{1x^2 - 25}{1x^2 - 4x - 5} \quad \frac{(x+5)\cancel{(x-5)}}{\cancel{(x-5)}(x+1)} = \frac{x+5}{x+1}$$

$0 = \frac{x+5}{x+1}$

$0 = x+5$

$x = -5$



Graph each equation and answer the following information as it applies.

Domain $\mathbb{R}, x \neq 3$

Holes None

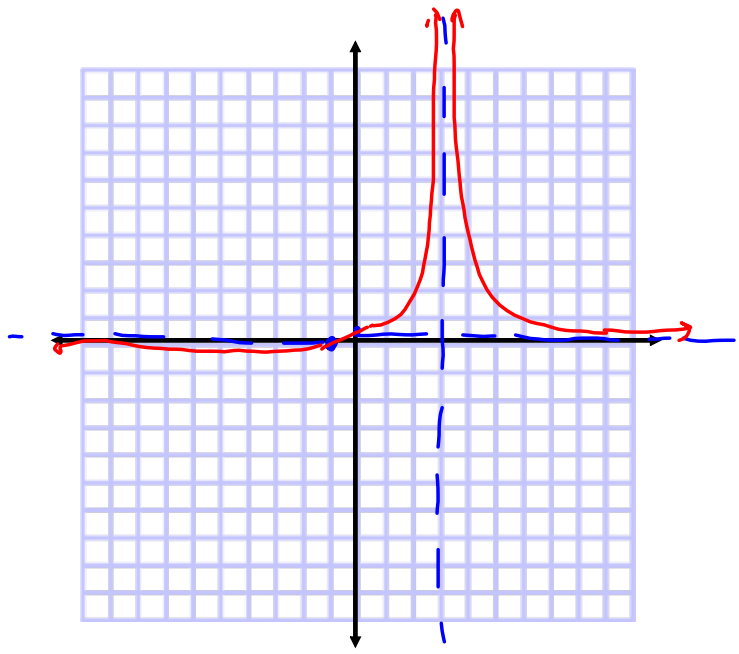
VA : $x = 3$

HA : $y = 0$

x-int $(-1, 0)$

y-int $(0, 1/9)$

$$f(x) = \frac{(x+1)}{(x-3)^2} \quad \frac{(0+1)}{(0-3)^2} = \frac{1}{9}$$



Graph each equation and answer the following information as it applies.

$$y = \frac{3x^2 - 12x}{x^2 - 2x - 3} \quad \frac{3x(x-4)}{(x-3)(x+1)}$$

Domain

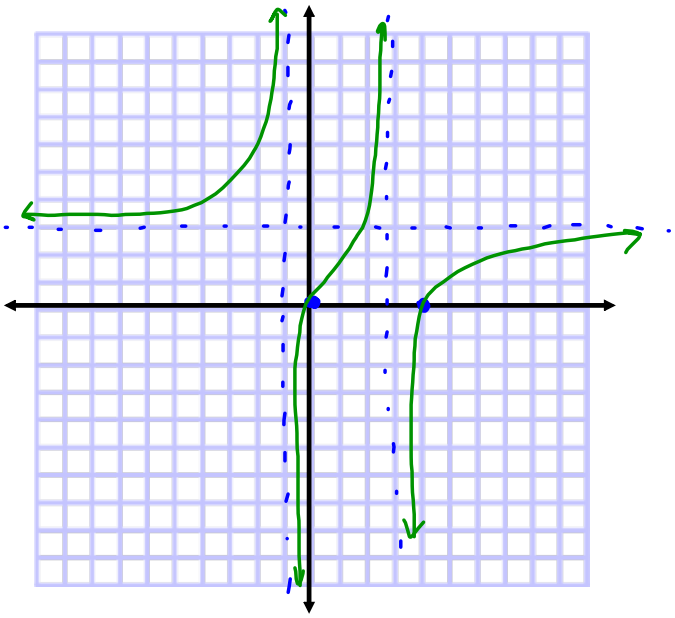
Holes None

VA $x = 3, -1$

HA $y = 3$

x-int $(0,0)$ $(4,0)$

y-int $(0,0)$



Worksheet 2.6 A