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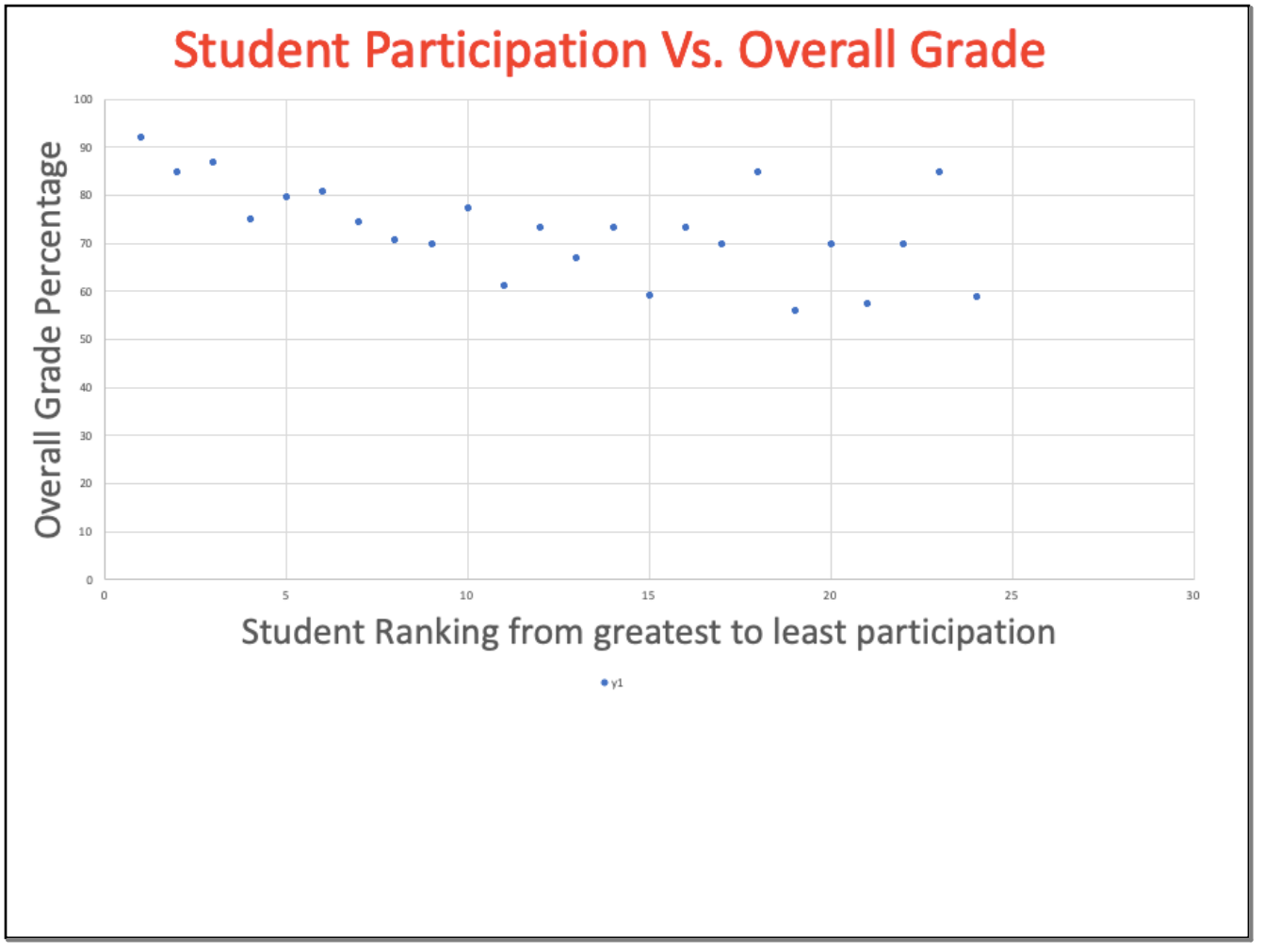

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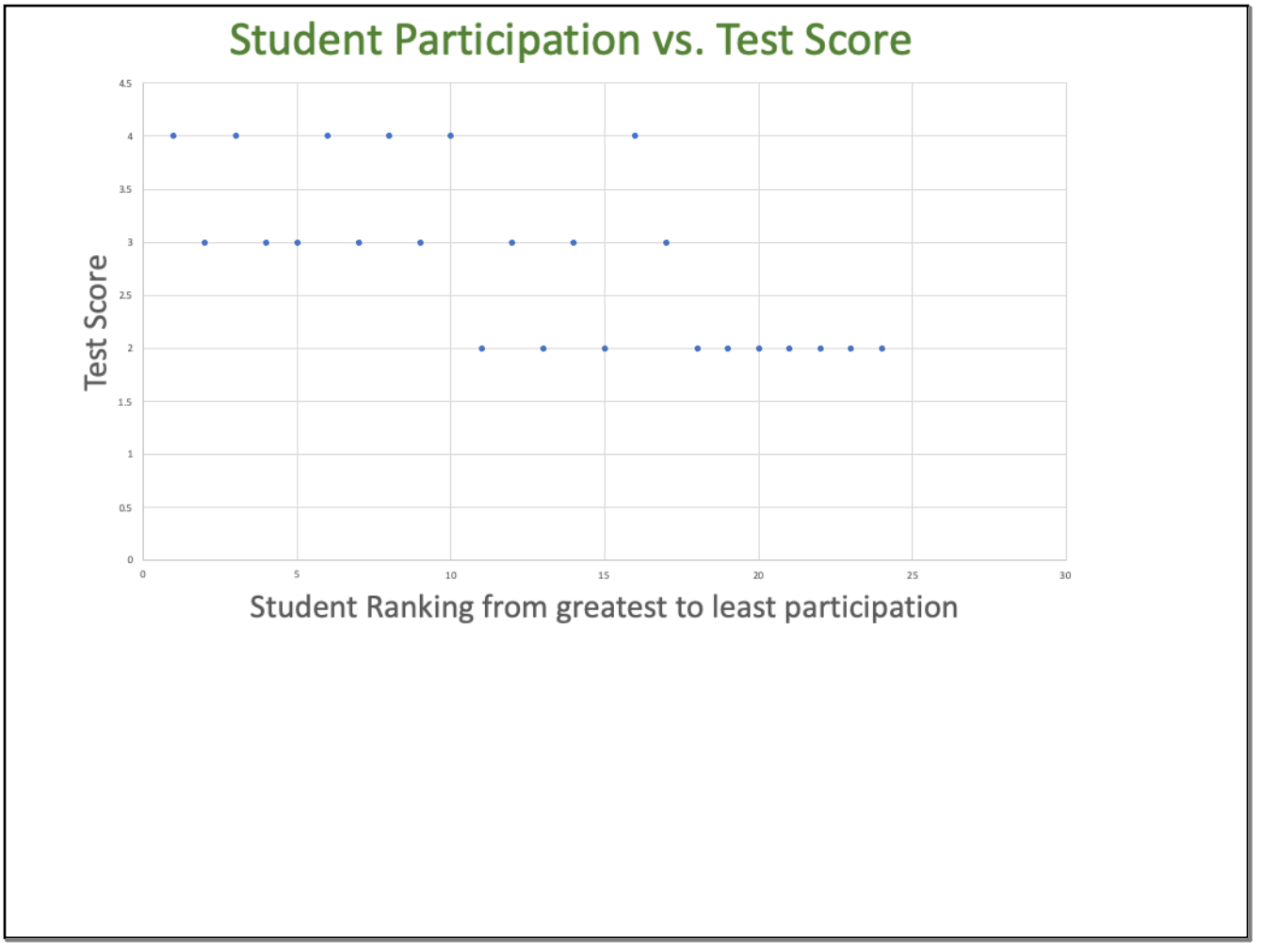

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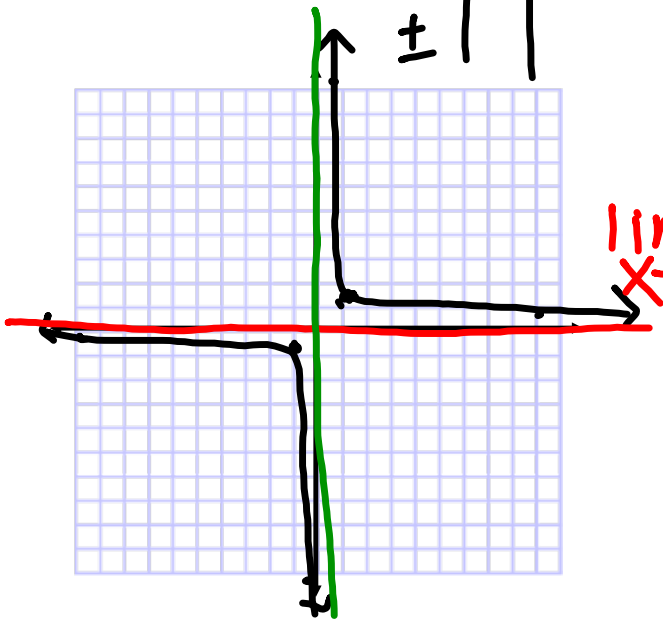
2.6 Rational Graphs

Objectives: (See objective sheet #1-16)

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

x	f(x)
±1000	
±.001	
±1	



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

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

Increasing None

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

Left End Behavior $\lim_{x\to-\infty} f(x) = 0$

Right End Behavior $\lim_{x\to\infty} f(x) = 0$

x-intercepts

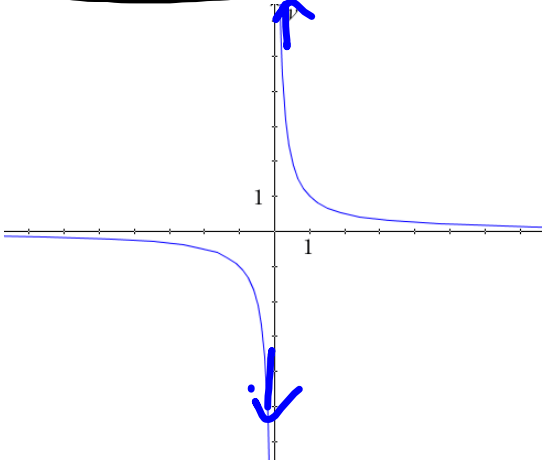
y-intercepts

Vertical Asymptote(s): $x=0$

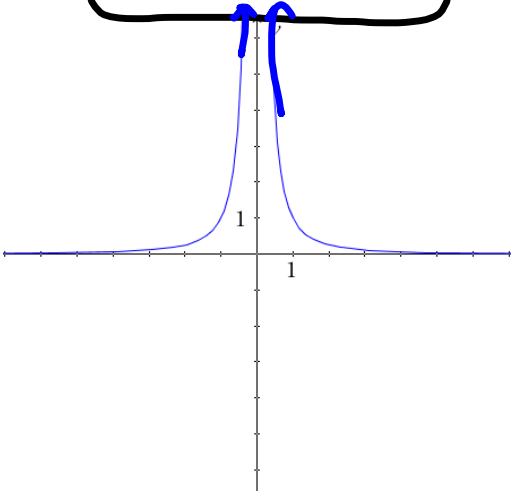
Horizontal Asymptote: $y=0$

Look at the following Graphs $f(x)=\frac{1}{x}$ and $f(x)=\frac{1}{x^2}$ and compare. What is going on?

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

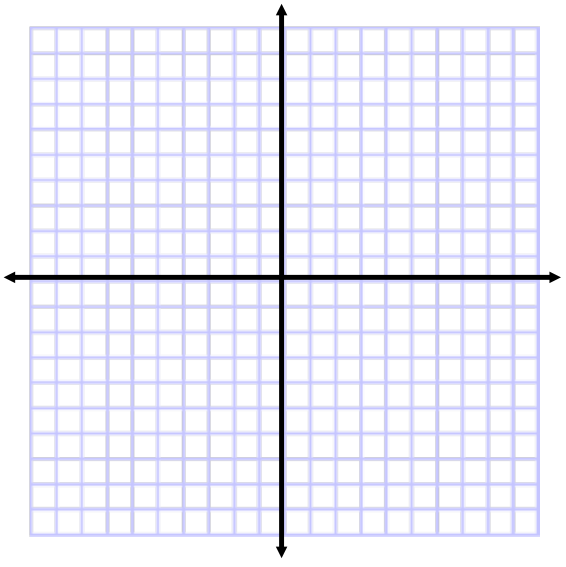


$f(x)=\frac{1}{x^2}$



Rational w/even power

Equation:



Domain
Range
Increasing
Decreasing
Left End Behavior

Right End Behavior

x-intercepts
y-intercepts
Vertical Asymptote(s):
Horizontal Asymptote:

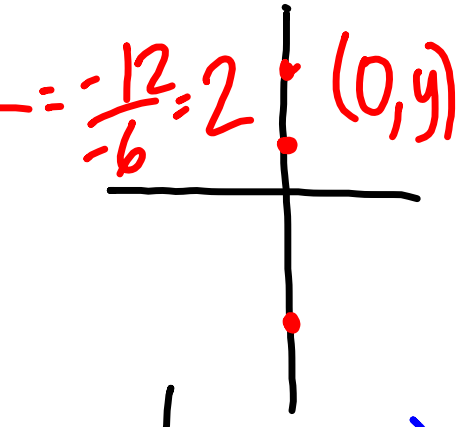
X and Y Intercepts

Y intercepts, x = 0

$$f(x)=\frac{3x-12}{x^2-5x-6}$$

$\frac{0-12}{0-0-6}=\frac{-12}{-6}=2$ (0,y)

(0,2)



X intercepts, y = 0

$$f(x)=\frac{3x-12}{x^2-5x-6}$$

$y=\frac{3x-12}{x^2-5x-6}$ $\cdot\ x^2-5x-6$

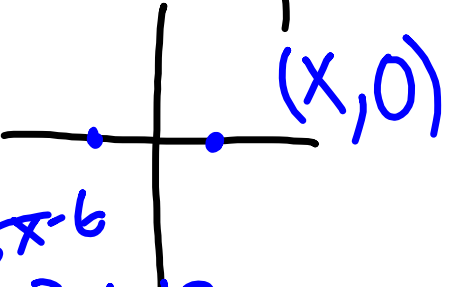
$\frac{3x-12}{(x-6)(x+1)}=0$

$0=3x-12$

$12=3x$

$4=x$

(4,0)



(x,0)

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Find the x and y intercepts of the following functions:

1

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

$$f(x)=\frac{3x-5}{x^2-5x+6}$$

$0=x^2-2x-3$

x-int: $0=(x-3)(x+1)$ x-int:

$3, -1$

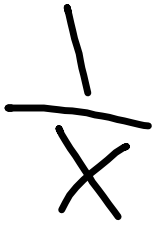
$(3,0)$ $(-1,0)$

y-int: y-int:

$\frac{-3}{2}$ $(0,-3/2)$

What will these functions look like?

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



Holes and Vertical asymptotes

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

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

$\frac{x+3}{x+1}$

VA: $x=2$
$x=-1$

Hole: $x=2$

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

$(x+1)\,0 = \frac{2x-3}{x+1}\,(x+1)$

$0 = 2x-3$

$3 = 2x$

$x = 3/2 \quad (3/2, 0)$

Domain: $(-\infty,-1)\cup(-1,\infty)$

X int: $(3/2, 0)$

Y int: $(0, -3)$

VA: $x = -1$

Hole(s): N/A

$\frac{2(0)-3}{0+1} = \frac{-3}{1}$

Find the holes, vertical asymptotes, and intercepts.

a. $f(x)=\frac{5x}{(x+2)}$

V.A: $x=-2$

Hole(s): $\emptyset$

Xint: (0,0) Yint: (0,0)

b. $f(x)=\frac{2x^3}{(x-5)}$

V.A: $x=5$

Hole(s): $\emptyset$

Xint: (0,0) Yint: (0,0)

c. $f(x)=\frac{(x+2)}{(x+2)(x-2)}$

d. $f(x)=\frac{(x^2-9)}{(x^2-5x+6)}$ $\frac{9}{-6}$ $(0,\frac{9}{-6})$

VA: 2

Hole(s) 3

xint: $(-3,0)$

Yint: $-\frac{3}{2}$

Horizontal Asymptotes (End Behavior):

To find the Horizontal Asymptote (end behavior model), compare the degrees of the numerator and denominator.

→ the degree in num vs. denom

Bottom heavy: $y = 0$

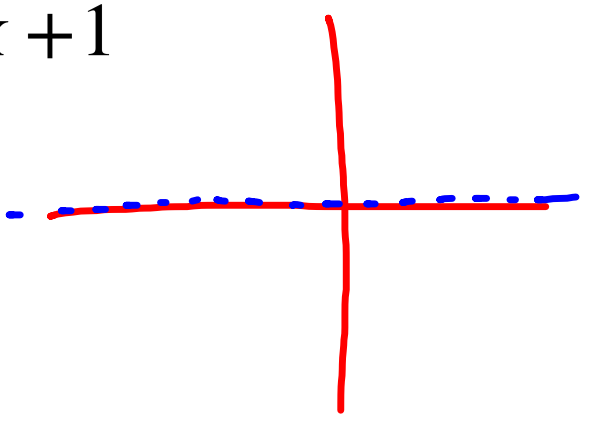
Equal: y = divide leading coefficients

Top heavy: divide equation - result is EBM

Bottom heavy: y = 0

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

$\frac{1}{x} \cdot \frac{1}{100000}$

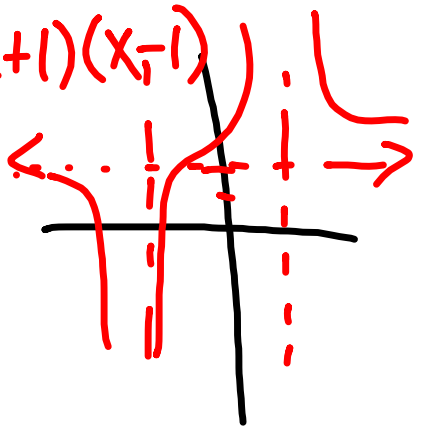


Equal: y = divide leading coefficients

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

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

$(x+1)(x-1)$



Top heavy: divide equation - result is End Behavior Model

$$f(x) = \frac{x^2 - x - 6}{x - 3} \qquad f(x) = \frac{(x^2 - x - 5)}{x - 3}$$

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

$x = 3$

$f(x) = x + 2$

$x - 3 \overline{)\, x^2 - x - 5}$

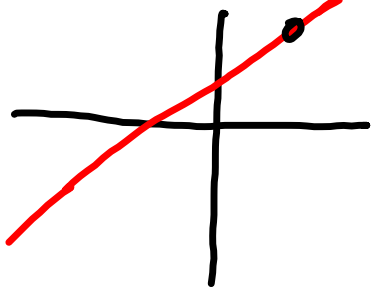
$x + 2$

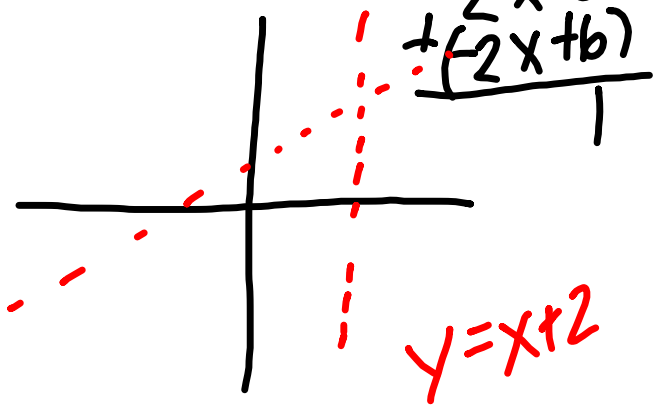
$+(x^2 - 3x)$

$2x - 5$

$+(-2x + 6)$

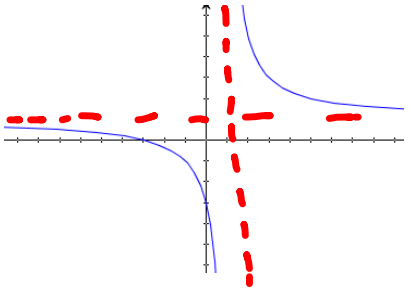
1



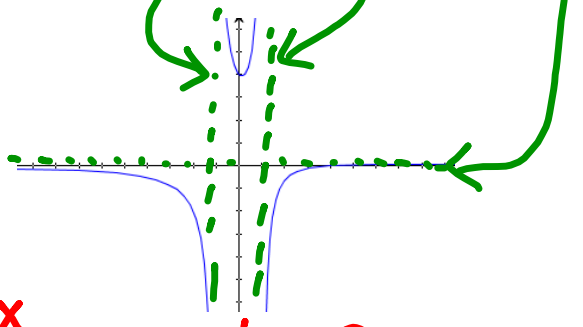


Horizontal Asymptotes
(End Behavior Models)

$f(x)=\dfrac{x+3}{x-1}$ $y=1$



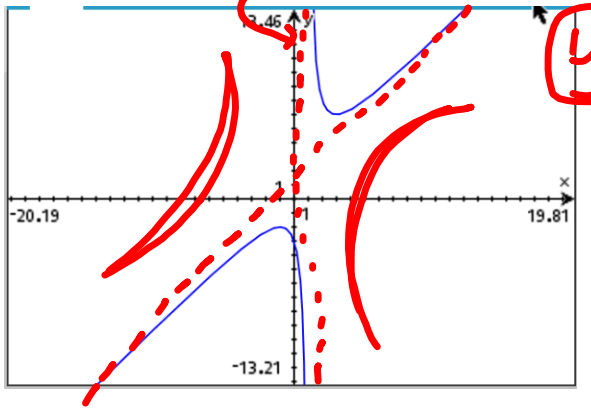
$f(x)=\dfrac{x-4}{(x+1)(x-1)}$ $y=0$



top heavy $f(x)=\dfrac{1x^2+3}{x-1}$ top x^2

1	0	3
1	1	4

$y=1x+1$

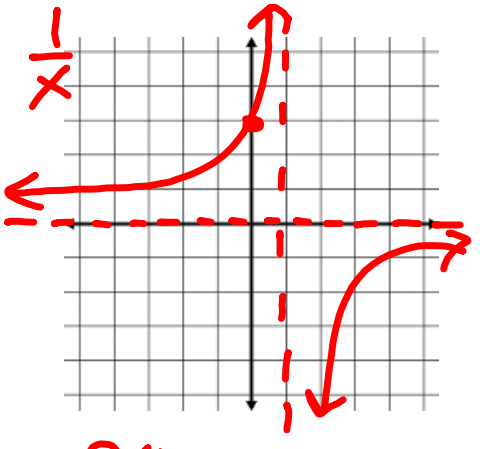


Identify the holes, vertical asymptotes, x and y intercepts, end behavior, and then make a sketch.

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

$0 = -3$

$0 \neq -3$?



Holes: ∅

VA: $x = 1$

x int: ∅

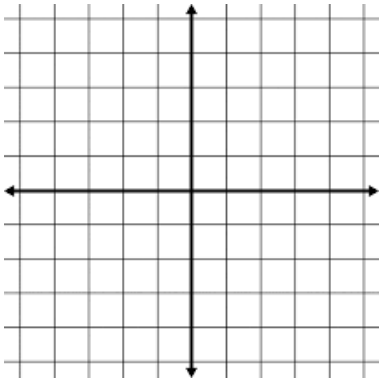
y int: $(0,3)$

HEB: $y = 0$

$f(x) = \frac{-3}{0-1} = \frac{-3}{-1} = 3$

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

$$f(x) = \frac{3x - 7}{x - 2}$$



Holes:

VA:

x int:

y int:

HEB:

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

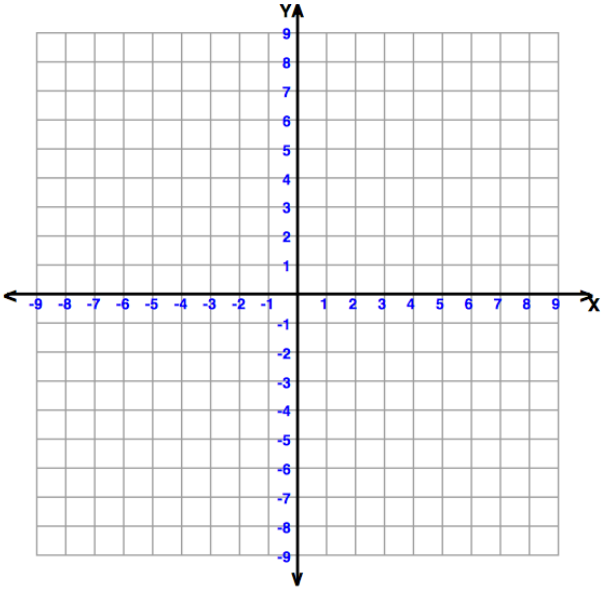
Holes:

VA:

x int:

y int:

HEB:



$$f(x) = \frac{x^2 - 9}{x^2 - 5x + 6}$$

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

$$\frac{6}{1}$$

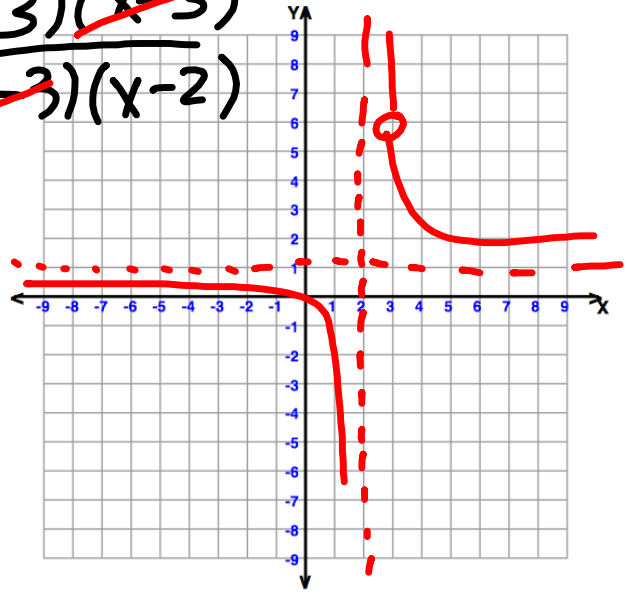
Holes: $x = 3$

VA:

x int:

y int:

HEB:



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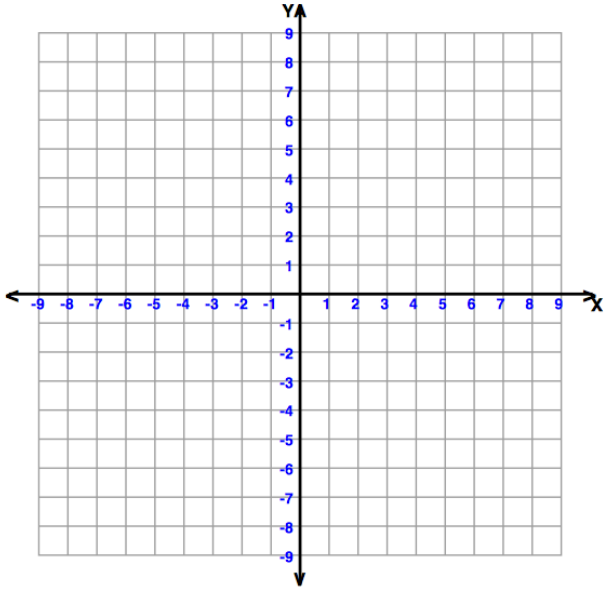
$$f(x)=\frac{x-1}{x^2-x-12}$$



Holes:

VA:

x int:

y int:

HEB:

Domain:

Range:

Increasing:

Decreasing:

End Behavior:

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

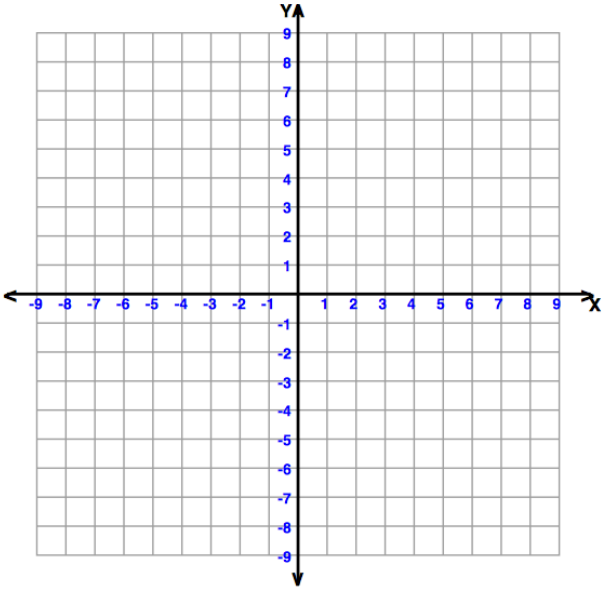
Holes:

VA:

x int:

y int:

HEB:



Domain:

Range:

Increasing:

Decreasing:

End Behavior:

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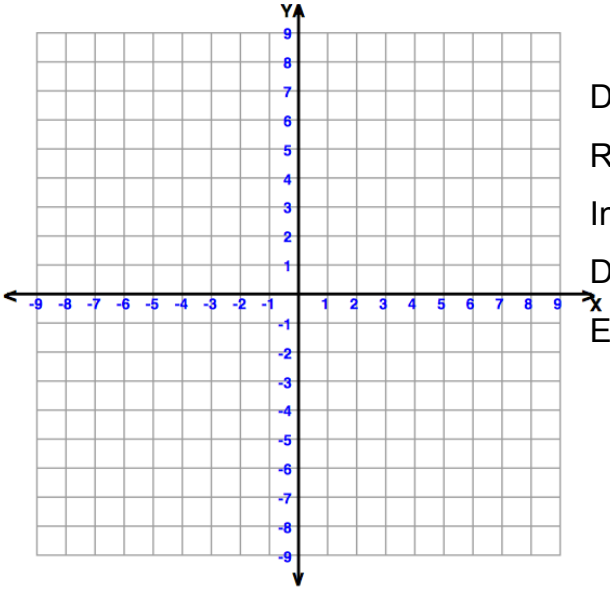
$$f(x)=\frac{-(x+1)(x+2)}{(x+3)(x+2)(x-1)^2}$$



Holes:

VA:

x int:

y int:

HEB:

Domain:

Range:

Increasing:

Decreasing:

End Behavior:

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