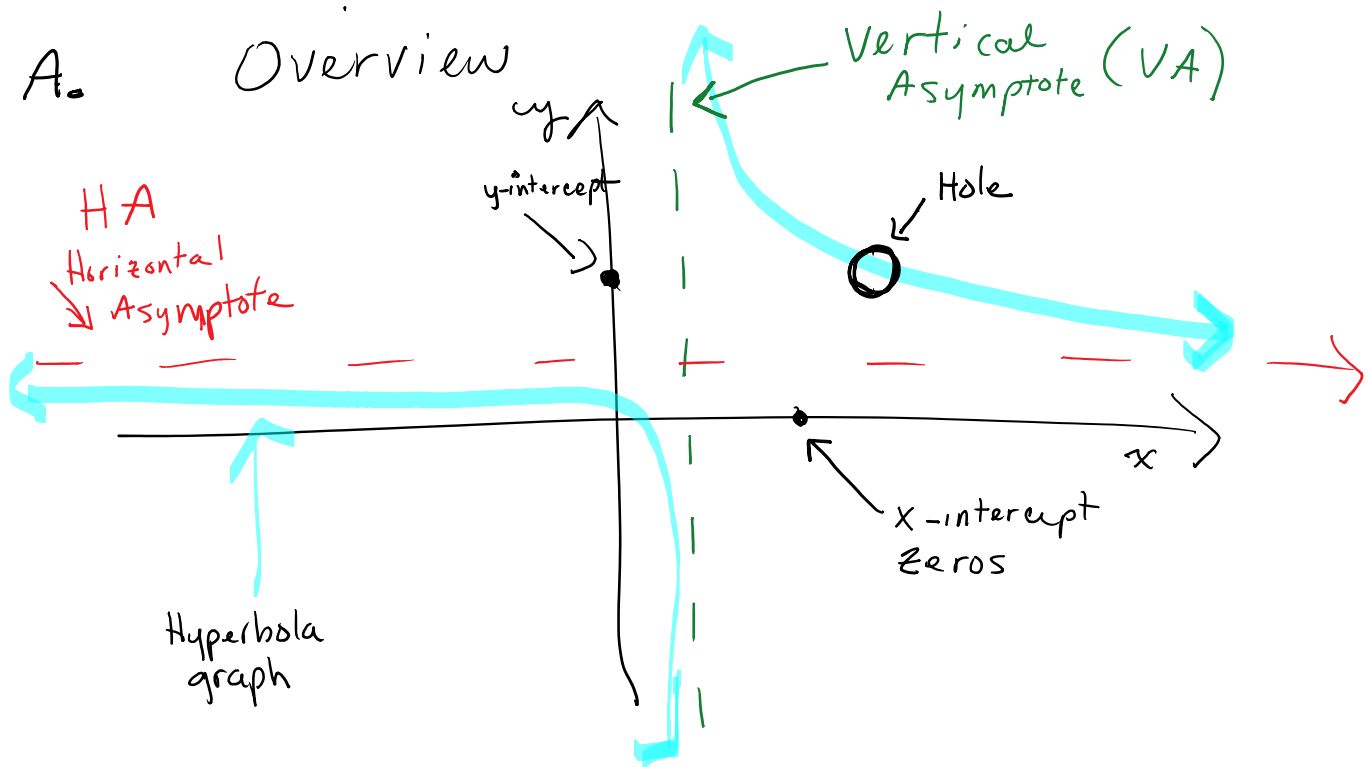


Graphing Rational Expressions

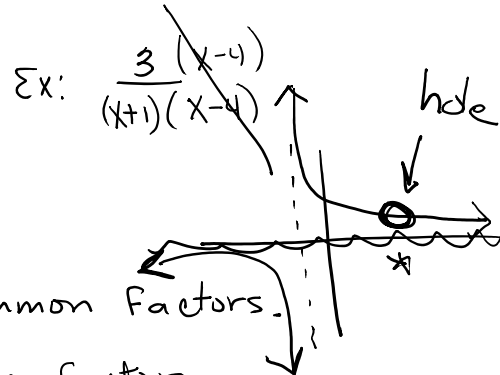
Thursday, March 29, 2018 10:12 AM

A. Overview



3. Analyse the function - graph.

1. Factor everything



• Holes:

holes come from common factors.

$x-4$ a common factor -

hole @ $x = 4$

• **VA**. vertical asymptotes.

VA come from all factors left over in denominator after common factors are divided away.

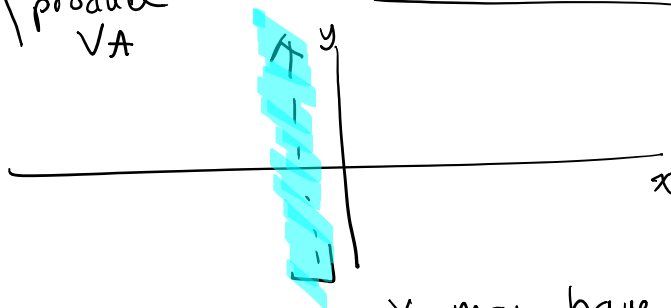
in denominator after common factors are divided away.

$$\frac{3(x-4)}{(x+1)(x-4)}$$

↑ produce VA

$$x+1=0$$

$$x = -1 \text{ VA.}$$



* may have more than 1 VA.

• Zeros.

set factors left in numerator = 0.

* may have
 no-zeros
 1-zero
 more than 1-zero

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

NO Zeros.

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

$$x+1=0$$

x = -1 Zero

• y-intercept

let $x=0$

calculate y .

• HA. Horizontal Asymptote.

$$\frac{Ax^m}{Bx^n} \quad \frac{5(x-3)(x+2)}{(x-3)(x+1)(x+1)} \quad \frac{5x^1}{1x^2}$$

* • $m < n$

HA $y = 0$

* • $m = n$

HA $y = \frac{A}{B}$

→ $m = n+1$
↘ $m > n+1$

slant $y = mx + b$ use long division
old.
don't have rational expression

- Common Sense, pick test points to draw hyperbolas.

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

1. Factor. ✓

2. • holes: None

• y-int $\frac{0-1}{0}$ No can do. no y-int.

• VA:

Set denominator factor = 0

$$\underline{\underline{x=0}} \text{ VA.}$$

- Zeros :
Set numerator = 0

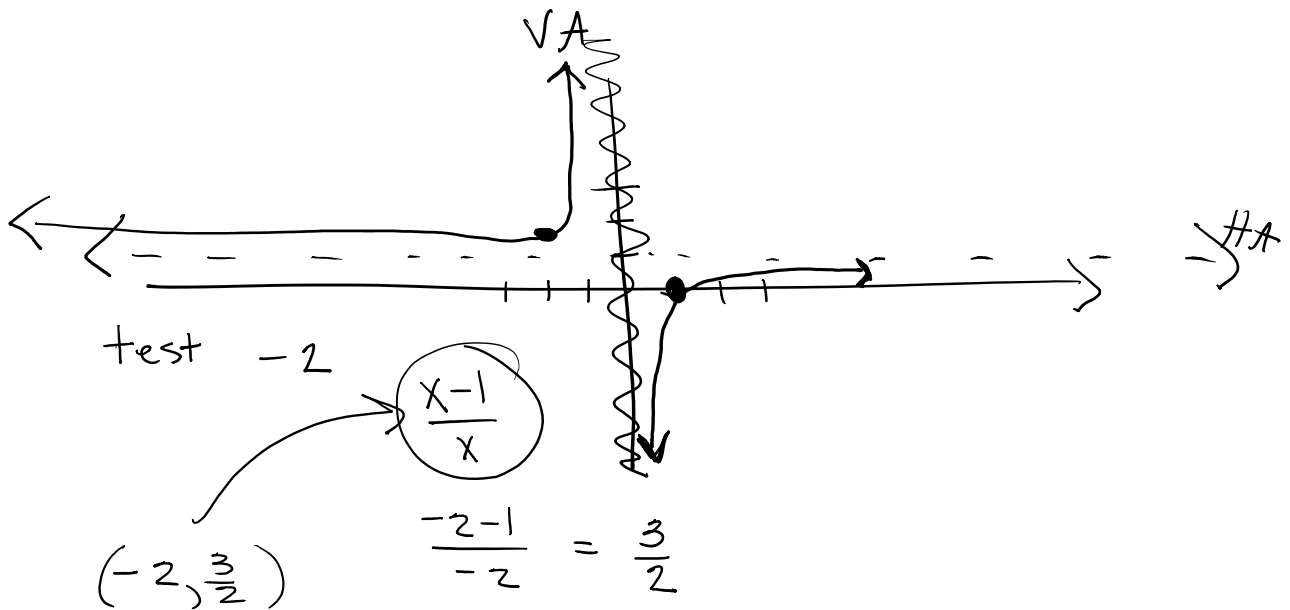
$$x-1=0$$

x=1 is x-intercept

- HA

$$\begin{matrix} m=1 \\ n=1 \end{matrix}$$

$$m=n \quad \frac{A}{B} \quad \boxed{y=1 \text{ HA}}$$



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

1. Factor: $\frac{-3(x-1)}{x+1}$

HA: $m=n \quad y = \frac{A}{B} = \underline{\underline{-3 \text{ HA}}}$

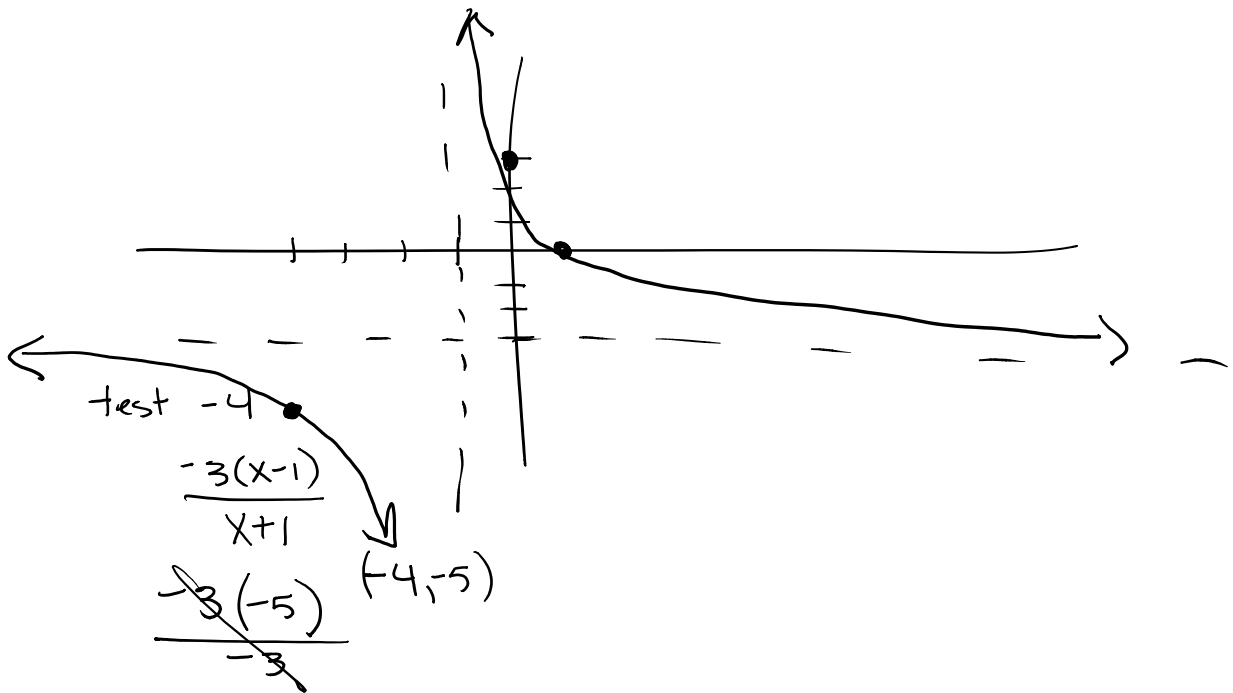
HA: $y = \frac{c}{b} = -3$ HA

VA: set $x+1=0 \Rightarrow x=-1$ VA

holes: nope

y-int: plug in 0. $\frac{-3(0-1)}{0+1} = 3$

Zeros: $x-1=0$ $x=1$



Ex: $\frac{x^2+x-2}{x^2-5x+4} = \frac{(x+2)(x-1)}{(x-4)(x-1)}$

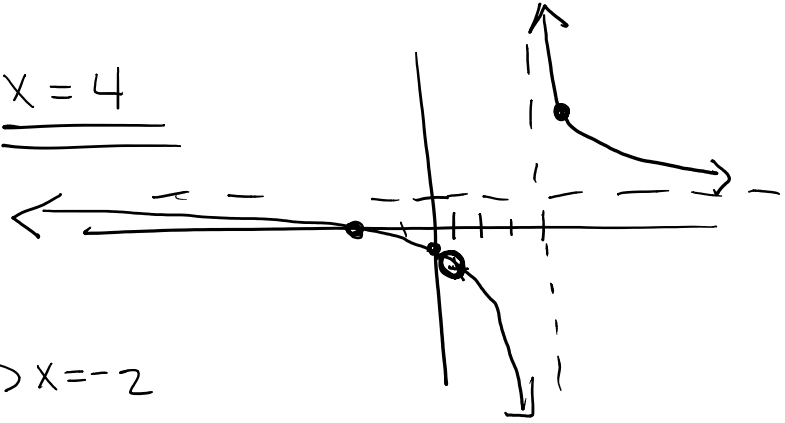
hole @ $x=1$

$$HA: \frac{A}{B} = \frac{1}{1} = 1 \quad \text{since } m=n$$

$$VA: x-4=0 \quad \underline{\underline{x=4}}$$

$$y\text{-int} \quad \frac{2}{-4} = -\frac{1}{2}$$

$$x\text{-int} \quad x+2=0 \Rightarrow x=-2$$



$$\text{test } x=5 \quad \frac{x+2}{x-4} = \frac{7}{1}$$

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

$$HA \quad m < n$$

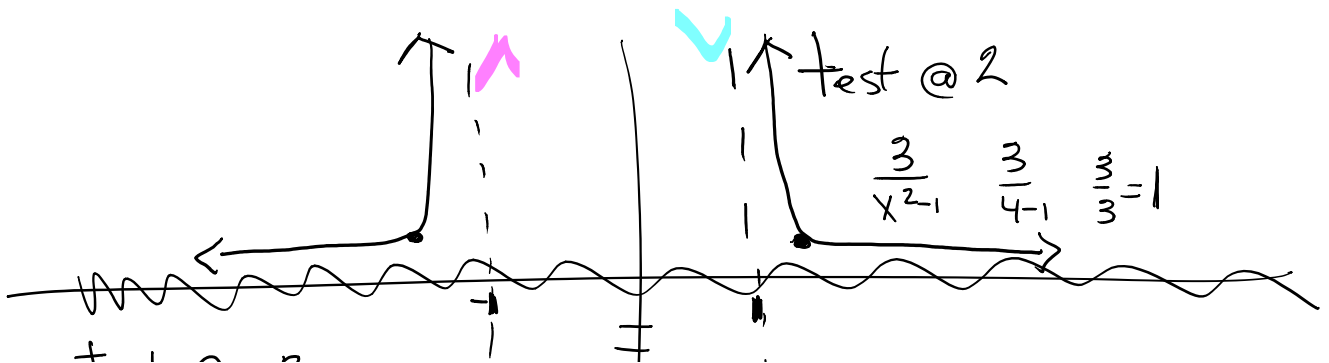
$$\underline{\underline{y=0}}$$

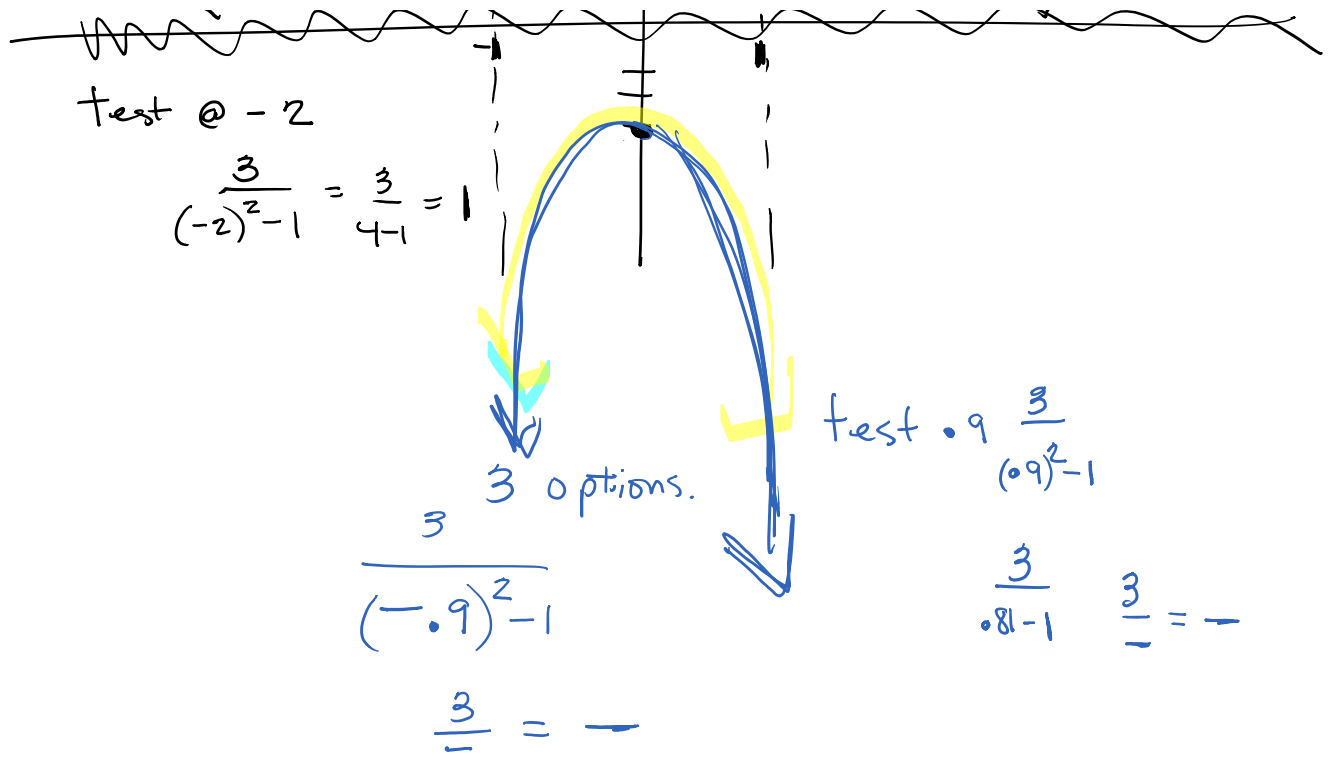
$$VA$$

$$\underline{\underline{x=1 \quad \text{and} \quad x=-1}}$$

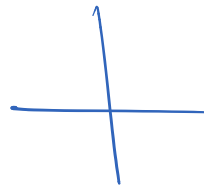
zero: none

$$y\text{-int} \quad \frac{3}{-1} = \underline{\underline{-3}}$$





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



#1.) HA. $f(x) = \frac{x^2 + 8x + 12}{x+3}$

Slant $y = mx + b$

Slant $y=mx+b$
long division

$$\begin{array}{r} x+5 \\ x+3 \overline{) x^2+8x+12} \\ \underline{-(x^2+3x)} \\ 5x+12 \end{array}$$

Slant asymptote

