

10/30/15 ①

11/01/15

## 2.6 Rational Functions and Asymptotes Day 1

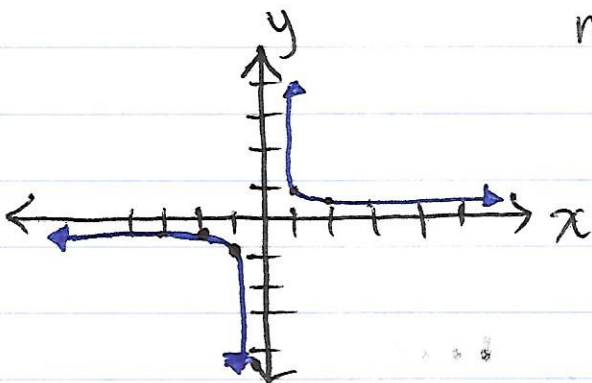
Parent function

Rational Function

$f(x) = \frac{1}{x}$ , Domain  $x \neq 0$   
because it would make the fraction undefined.

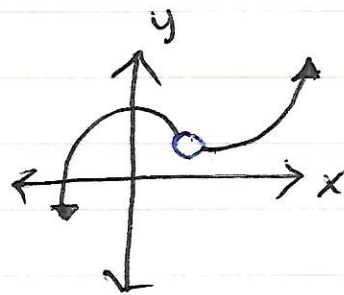
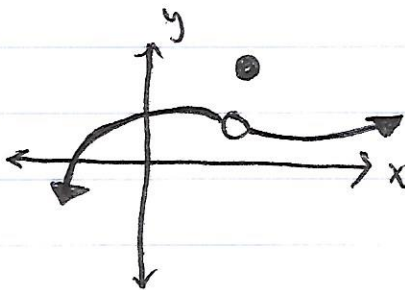
Graph

Is the graph continuous?



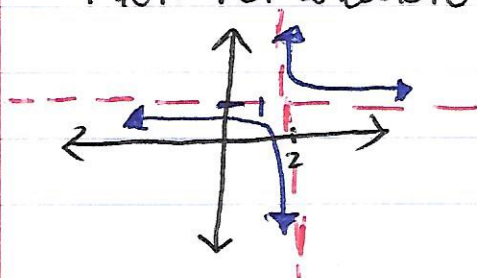
Types of discontinuity

Removable



There is a "hole".

Non-removable



Asymptote

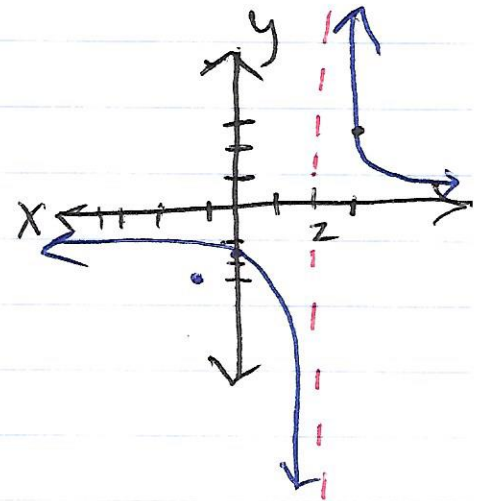
Asymptote - a line that continually approaches a given graph but does not meet at any finite distance.

Ex. 1

To find Vertical Asymptotes

Find Vertical asymptotes) of

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



Steps:

- ① set denominator equal to zero
- ② solve for x

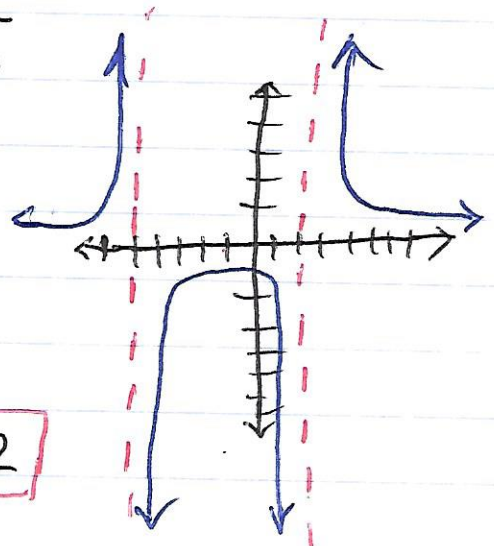
$$x - 2 = 0$$

$$\boxed{\text{V.A } x = 2}$$

Ex. 2

Find V.A

$$f(x) = \frac{1}{x^2 + 3x - 10}$$



$$x^2 + 3x - 10 = 0$$

$$a = 1 \quad b = 3 \quad c = -10$$

$$\begin{array}{r} -10 \\ 5 \quad -2 \\ \hline 3 \end{array}$$

$$(x+5)(x-2)$$

$$\boxed{\text{V.A } x = -5 \quad x = 2}$$

# Removable Discontinuity

Find the V.A. & hole(s) on the graph

$$f(x) = \frac{x^2 + x - 2}{x^2 - x - 6} = \frac{(x-1)(x+2)}{(x+2)(x-3)}$$

Steps:

① Factor top & bottom

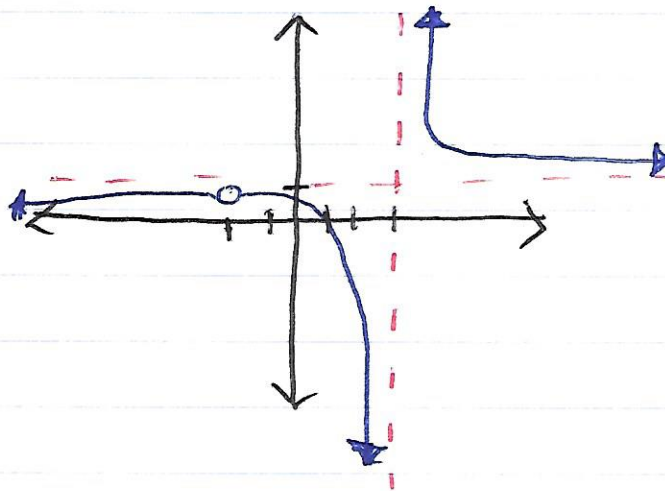
② Simplify

V.A is  $x = 3$

hole at  $x = -2$

Use factors that cancel out to find holes. ☺

# Graph



x	f(x)
-2	Error
+3	Error



④

To find  
Horizontal  
Asymptotes,

We must  
look at the  
degree of  
the Numerator  
& denominator

Degree:  
Highest  
Exponents

$$f(x) = \frac{X^{\text{Small}}}{X^{\text{Big}}}$$

$$f(x) = \frac{X^{\text{same}}}{X^{\text{same}}}$$

$$f(x) = \frac{X^{\text{Big}}}{X^{\text{Small}}}$$

# Horizontal Asymptotes

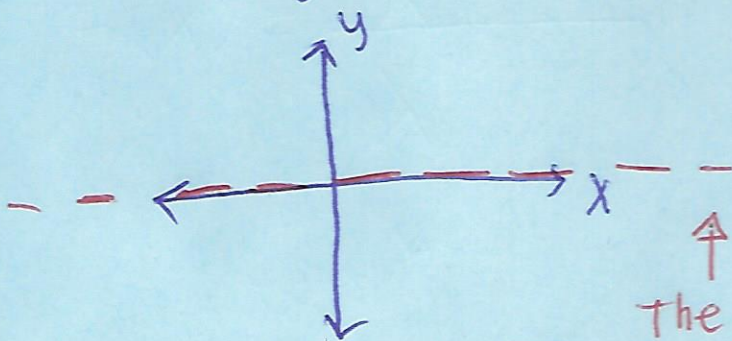


If the degree of numerator is lower than the denominator

The H.A is  $y=0$

Ex.  $f(x) = \frac{x^4}{x^5}$

H.A:  $y=0$

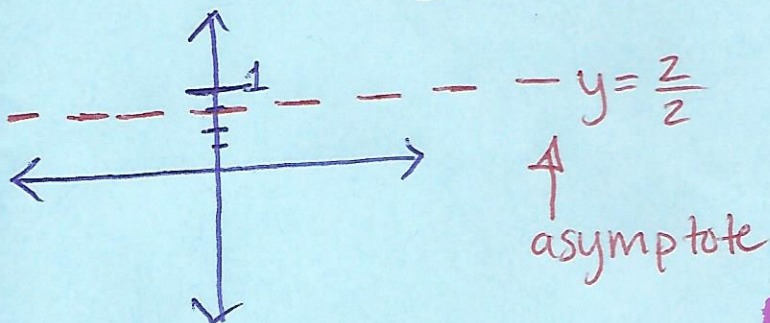


The graph would approach this line

If the numerator & denominator have the same degree, then the H.A is at the ratio of the coefficients

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

H.A:  $y = \frac{2}{3}$



asymptote

If the numerator has a higher degree than the denominator,

Then the H.A Does Not Exist

DNE

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

H.A: DNE

# Horizontal Asymptotes