

Name _____

Notes

Date _____

NOTES: Completely Graph a Rational Function

(Lesson 3)

Review of Lesson 1 and Lesson 2:

Horizontal asymptotes have a different set of rules.

Degree: the largest exponent of a polynomial

- Rule #1: If the degree of denominator > degree of numerator, that means there's a horizontal asymptote at $y=0$. (BOBO)
- Rule #2: If the degree of numerator > degree of denominator, that means there is no horizontal asymptote. (BOTN)
- Rule #3: If the degrees are the same, that means there's a horizontal asymptote at the ratio of leading coefficients. (EATS DC)

★ Remember, BOBO BOTN EATS DC!
Bigger On Bottom, 0; Bigger On Top, None; Exponents Are The Same, Divide Coefficients

Example 1... Find the horizontal asymptote of the graph of each rational function.

a. $y = \frac{-2x+6}{x-1}$ deg: 1 / deg: 1

b. $y = \frac{2x^2+5}{x+1}$ deg: 2 / deg: 1

c. $y = \frac{x+3}{(x-1)(x-5)}$ deg: 1 / deg: 2

EATS DC
 HA: $y = -\frac{2}{1} = -2$

BOTN
 HA: none

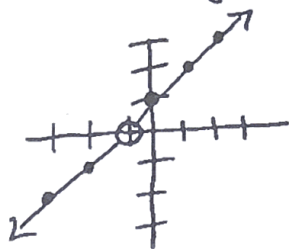
BOBO
 HA: $y = 0$

When we put all of that information (removable disc. (holes), vertical asymptotes, horizontal asymptotes) together, we can get a good idea of what the graph of a rational function looks like.

Example 2... Sketch the graph of each function.

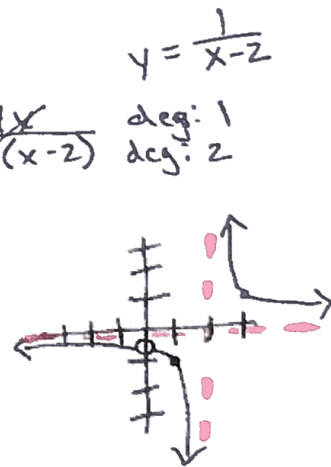
a. $y = \frac{x^2+2x+1}{x+1} = \frac{(x+1)(x+1)}{x+1}$ deg: 2 / deg: 1 $y = x+1$

VA: none
 Hole: $x = -1$
 HA: none



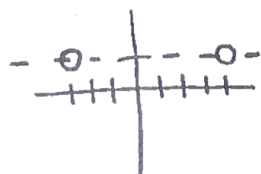
b. $y = \frac{4x}{4x^2-8x} = \frac{4x}{4x(x-2)}$ deg: 1 / deg: 2

VA: $x = 2$
 Hole: $x = 0$
 HA: $y = 0$



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

VA: none
 Hole: $x = 4, -3$
 HA: $y = 1$



x	y
1	-1
3	1