Y-Intercepts: Replace x with zero.

All that will remain are the two constants.

therefore, y-intercepts of rational functions are ratios of the constants.

A graph can have, at most, one y-intercept.

X-Intercepts: Replace y with zero.

This means you are setting the ratio equal to zero and solving for x.

The only way a ratio equals zero is if the NUMERATOR equals zero.

therefore, x-intercepts of rational functions are zeros of the numerator.

In general, the x-intercepts of a Rational Function are the:

Zeros of the numerator (as long as they don't match zeros of the denominator, otherwise, they are holes)

A graph can have multiple x-intercepts.

find the x and y-intercepts of each function, if any.

1. $y = \dfrac{x^2 + 6x + 8}{2x^3 - 18x}$

$= \dfrac{(x+4)(x+2)}{2x(x^2-9)}$

$= \dfrac{(x+4)(x+2)}{2x(x+3)(x-3)}$

y-int:

$y = \frac{8}{0}$

NO y-int

x-int:

$x = -4, -2$

Neither of these are zeros of the denominator so they are not holes.

2. $y = \dfrac{4x^2 + 12}{3x^2 - x - 24}$

y-int: $y = \frac{12}{-24} = -\frac{1}{2}$

x-int: the numerater will never = zero, therefore, there are

NO x-int

Find the x-intercepts, if any.

$$\frac{x^2-4}{x^2-7x-18} = \frac{(x+2)(x-2)}{(x+2)(x-9)}$$

-18

$-9 \quad +2$

-7

$\boxed{\text{x-int: } x = 2}$

($x=-2$ is a hole not an x-int)

You can now finish:

Hwk #6.

Practice Sheet: Horizontal Asymptotes and x & y-intercepts

Due tomorrow

Find all VA, HA, x-int, and y-int.

$$y = \frac{x^0+1}{x^2+x-6} = \frac{x+1}{(x+3)(x-2)}$$

HA: $y=0$ the degree of the denominator is bigger than the degree of the numerator.

y-int $= \frac{1}{-6}$

VA: $x=-3, 2$

X-int: $x=-1$

$$y = \frac{x+1}{x^2+x-6}$$

HA: $y = 0$

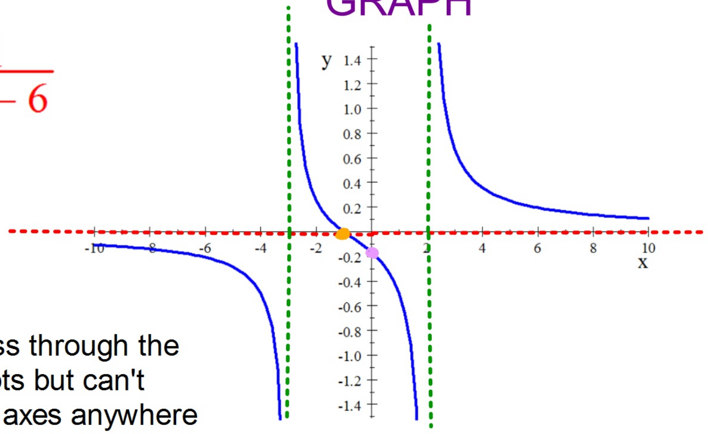
VA: $x = -3,2$

x-int: $x = -1$

y-int: $y = -1/6$

A graph MUST pass through the axes at its intercepts but can't touch or cross the axes anywhere else.

GRAPH



Find all VA, HA, x-int, and y-int.

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

HA: $y = \frac{3}{1} = 3$

y-int: $y = \frac{-12}{-12} = 1$

VA: $x = 4, -3$

x-int: $x = \pm 2$

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

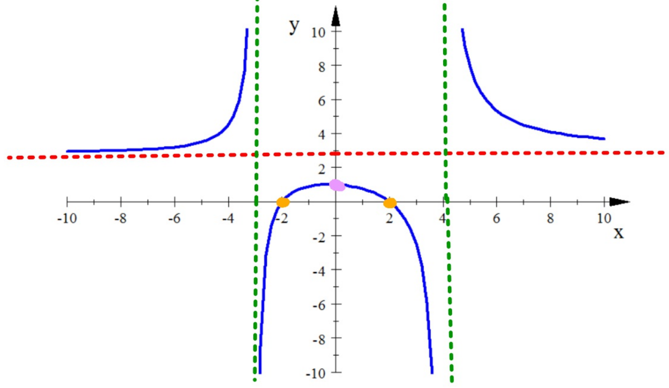
GRAPH

HA: y = 3

VA: x = -3,4

x-int: x = ±2

y-int: y = 1



Sec 9-4

Rational Expressions:

The ratio of two polynomials.

Polynomials: Have whole number exponents and real coefficients.

A rational expression is in its simplest form when:

The denominator and numerator have no common factors.

This is NOT a Rational Function, why?

$$\frac{\sqrt{x^2 - 5x + 3}}{2x - 9}$$

The numerator isn't a polynomial!

A radical represents a fractional exponent.

Sec 9-4
Simplifying Rational Expressions

- Factor all numerators and denominators
- Cancel factors common to the numerator and denominator
- Restrictions are any values that make the denominator zero at any point (beginning to end)

Simplify. State restrictions on the variable.

1. $\dfrac{9x^2y^8}{12x^5y^3}$

$= \boxed{\dfrac{3y^5}{4x^3}}$

$y, x \neq 0$

2. $\dfrac{6x^4 - 150x^2}{4x^3 - 40x^2 + 100x}$

$= \dfrac{6x^2(x^2-25)}{4x(x^2-10x+25)}$

+25, -5, -5, -10

$= \dfrac{6x^2(x+5)\cancel{(x-5)}}{4x(x-5)\cancel{(x-5)}}$

$= \boxed{\dfrac{3x(x+5)}{2(x-5)}}$

$x \neq 0, 5$