1. Find the equations for all VA and HA, if any. Find all Holes and x & y - intercepts, if any.

$$\frac{2x^3 + 8x^2 - 10x}{x^3 - x^2 - 9x + 9}$$

$= 2x(x^2+4x-5)$

$= 2x(x+5)(x-1)$

$(x-1)(x+3)(x-3)$

HA: ✓ $y = 2$

VA: $x = \pm 3$

Holes: $x = 1$

x-int: $x = 0, -5$

y-int: ✓ $y = 0$

$x^2 - 1$

x^3	$-x^2$
$-9x$	$+9$

Sec 9-4

Simplifying Rational Expressions

1. Factor all numerators and denominators

2. Cancel factors common to the numerator and denominator

3. Restrictions are any values that make the denominator zero at any point (beginning to end)

2. Simplify this rational expression. State restrictions on the variables.

$$\frac{4x^3 + 4x^2 - 24x}{8x^6 - 104x^4 + 288x^2}$$

$= 4x(x^2+x-6)$

$8x^2(x^4-13x^2+36)$

$4x(x-2)(x+3)$

$8x^2(x^2-4)(x^2-9)$

$8x^2(x+3)(x-3)(x+2)(x-2)$

Restrictions: $x = 0, \pm 3, \pm 2$

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

3. Of all the houses in a certain neighborhood, 80% have garages. Of those with garages, 60% have two-car garages. If there are 56 houses with garages that are not two-car garages, how many houses are there in the neighborhood?

A. 26 B. 93 C. 117 D. 156 E. 175

# of Houses w/ Garages

40% Do not have two car.

56 is 40% of what

$56 = .40x$

$x = 140$

140 have garages

140 is 80% of what

$140 = .80x$

$x = 175$ houses

Simplify without a calculator.

$$\frac{36 \div 4}{27 \div 3} \cdot \frac{15 \div 3}{16 \div 4}$$

$$\frac{9}{9} \cdot \frac{5}{4} = 1 \cdot \frac{5}{4}$$

$$= 5/4$$

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!

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 or end)

Simplify. State restrictions on the variable.

1. $\dfrac{9x^2y^8}{12x^5y^3}$ $x \neq y \neq 0$ $= \dfrac{3y^5}{4x^3}$

$\dfrac{6x^4 - 150x^2}{4x^3 - 40x^2 + 100x} = \dfrac{6x^2(x^2-25)}{4x(x^2-10x+25)} = \dfrac{6x^2(x-5)(x+5)}{4x(x-5)(x-5)}$

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

$x = 0, +5$

Sec 9-4 Simplifying the Product or Quotient of Rational Expressions

- Factor all numerators and denominators.
- If mulitplying you can simplify within the same fraction and/or cross cancel. Finish by multiplying numerators and multiplying denominators so that you can write the answer as a single fraction.
- Instead of dividing, multiply by the reciprocal then simplify as you would when multiplying.
- State restrictions on the variable.

Simplify. State restrictions on the variables

$$\frac{x^2-49}{x^2-9x+14}\cdot\frac{x^2-2x}{4x+28}$$

$$=\frac{(x+7)(x-7)}{(x-2)(x-7)}\cdot\frac{x(x-2)}{4(x+7)}$$

$x \neq 2, \pm 7$

$$=\frac{x}{4}$$

Simplify. State restrictions on the variables.

$$\frac{x^2-16}{9x^2+18x}\div\frac{x^2-3x-4}{3x^2+6x}$$

$$\frac{x^2-16}{9x^2+18x}\cdot\frac{3x^2+6x}{x^2-3x-4}=\frac{(x+4)(x-4)}{3x(x+2)}\cdot\frac{3x(x+2)}{(x-4)(x+1)}$$

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

$x \neq 0, -2, 4, -1$