Let's Get Rational

A rational expression is an algebraic fraction with a polynomial in the numerator and/or denominator.

Think of this unit as "factoring with fractions". Sound fun?

$\frac{3}{1}$

$\frac{1}{2x}$

$\frac{x+2}{x^2-3x+4}$

$\frac{x^2+1}{1}$

The additional rule that you have to remember is that you cannot divide by zero. As we will have variables in our denominators, this will be a possibility. We must show the non-permissible values.

Determine non permissible values: (where divide by zero is a possibility)

$\frac{2x}{x-2}$ NPV $x-2 \neq 0$ $x \neq 2$	$\frac{5}{2xy^3}$ $x \neq 0$ $y \neq 0$

$$\frac{5x-6}{x^2-3x+2}$$

$x^2 - 3x + 2 \neq 0$

$m \to 2$
$a \to -3$
$-2, -1$

$x^2 - x - 2x + 2 \neq 0$

$x(x-1) - 2(x-1) \neq 0$

$(x-1)(x-2) \neq 0$

$x-1 \neq 0$ AND $x-2 \neq 0$

$x \neq 1$ $\quad x \neq 2$

Factor:

1. Greatest Common Factor
   - ➢ Always. Everytime.
2. Look for a difference of squares
   - ➢ $a^2 - b^2 = (a + b)(a - b)$
3. Quadratic Factoring (decomposition)
   - ➢ We will want to factor so that we can cancel. Do not use the method of graphing, or completing the square. You need to factor.

Simplify:

$$\frac{x+2}{x^2+4x+4}$$

$m \to 4$

$a \to 4$

$(2, 2)$

$x^2 + 4x + 4$

$x^2 + 2x + 2x + 4$

$x(x+2) + 2(x+2)$

$(x+2)(x+2)$

$(x+2)^2$

$$\frac{x+2}{(x+2)(x+2)}$$

$$\frac{1}{x+2}$$

NPV

$x+2 \neq 0$

$x \neq -2$

$m \to 15$ ✓
$a \to 8$ ✓
$(5, 3)$

$x^2+8x+15$

$x^2+5x+3x+15$

$x(x+5)+3(x+5)$

$(x+5)(x+3)$

$$\frac{2x^2+6x}{x^2+8x+15} \qquad \frac{2x(x+3)}{(x+5)(x+3)}$$

$$= \frac{2x}{x+5}$$

NPV

$x+5 \neq 0$

$x \neq -5$

$x+3 \neq 0$

$x \neq -3$

NPV

$x \neq \pm 4$

$$\frac{8-2x}{x^2-16} \qquad \frac{2(4-x)}{(x+4)(x-4)}$$

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

$$\frac{-2}{x+4}$$

$$\frac{16x^2-9y^2}{8x-6y}$$

$$\frac{16x^2-9y^2}{2(4x-3y)}$$

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

$$\frac{4x+3y}{2}$$

$2(4x-3y) \neq 0$

$4x-3y \neq 0$

$4x \neq 3y$