

## Rational Expressions Multiplication

### To Multiply Rational Expressions

- 1.) Completely factor numerators & denominators of both fractions.
- 2.) Multiply tops together & bottoms together (but leave factored)
- 3.) Cancel factors that are common to both the numerator & denominator (write in lowest terms).

### Examples:

$\frac{y^2 - x^2}{3x^2 + 3xy} \cdot \frac{3x^2 + 6x}{3x^2 - 2xy - y^2}$ ; First note that the numerator of the first expression has the y term listed first, and the x term is negative and listed second. Before you do anything else on this problem, factor (-1) from this part of the problem:

$$\frac{(-1)(x^2 - y^2)}{3x^2 + 3xy} \cdot \frac{3x^2 + 6x}{3x^2 - 2xy - y^2} \xrightarrow{\text{Factor Expressions}} \frac{(-1)(x+y)(x-y)}{3x(x+y)} \cdot \frac{3x(x+2)}{(3x+y)(x-y)}$$

$$\frac{\cancel{(-1)(x+y)}\cancel{(x-y)}}{\cancel{3x}(x+y)} \cdot \frac{\cancel{3x}(x+2)}{(3x+y)\cancel{(x-y)}} \rightarrow \frac{(-1)(x+2)}{(3x+y)}$$

$$\frac{3x^2 + 12x}{6} * \frac{9}{2x + 8} \rightarrow \frac{3x(x+4)}{3 * 2} * \frac{3 * 3}{2(x+4)} \xrightarrow{\text{Cancel } 3(x+4)} \frac{x * 3 * 3}{2 * 2} \rightarrow \frac{9x}{4}$$

$$\frac{s^2 - t^2}{2s + 4t} * \frac{s + 2t}{5s - 5t} \xrightarrow{\text{Factor}} \frac{(s-t)(s+t)}{2(s+2t)} * \frac{(s+2t)}{5(s-t)} \xrightarrow{\text{Cancel}} \frac{s+t}{10}$$