

## Multiply Rational Expressions

Let a, b, c, and d be polynomials,

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd} \quad \text{Simplify}$$

where  $b \neq 0$  and  $d \neq 0$ .

Find the product. **Factor First!!**

Example 1:

$$\frac{3x^2}{4x} \cdot \frac{6x^2}{9x^3} = \frac{3x^2 \cdot 6x^2}{4x \cdot 9x^3} = \frac{18x^4 \cdot \cancel{18}}{36x^4 \cdot \cancel{18}} = \frac{1}{2}$$

Example 2:

GLF

$$\frac{5x^2 - 5x}{x^2 - 7x + 10} \cdot \frac{x^2 - 3x - 10}{8x^2 + 16x} \quad \text{GLF}$$

$$\frac{5x(x-1)}{(x-2)(x-5)} \cdot \frac{(x+2)(x-5)}{8x(x+2)} = \frac{5(x-1)}{8(x-2)}$$

Diff. of Squares

Example 3:

$$\frac{x^2 - 9}{5x + 15} \cdot \frac{4x + 4}{x^2 - 7x + 12}$$

$$\frac{(x-3)(x+3)}{5(x+3)} \cdot \frac{4(x+1)}{(x-3)(x-4)} = \frac{4(x+1)}{5(x-4)}$$

Example 4:

$$\frac{2x}{x^2 - 6x + 8} \cdot \frac{(x-4)}{1}$$

$$\frac{2x}{(x-4)(x-2)} \cdot \frac{(x-4)}{1} = \frac{2x}{x-2}$$

## Divide Rational Expressions

Let a, b, c, and d be polynomials,

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c} = \frac{ad}{bc}$$

where  $b \neq 0$ ,  $c \neq 0$  and  $d \neq 0$ .

Find the quotient. **Keep-change-flip**

Example 5:

$$\frac{x^4}{5x} \div \frac{7x^4}{15x^2} = \frac{x^4}{5x} \cdot \frac{15x^2}{7x^4} = \frac{15x^4 \cdot \cancel{15}}{35x^4 \cdot \cancel{15}} = \frac{3x}{7}$$

Example 6:

$$\frac{x^2 - 2x - 15}{3x - 3} \div \frac{x^2 + 5x + 6}{x - 1}$$

$$\frac{x^2 - 2x - 15}{3x - 3} \cdot \frac{x - 1}{x^2 + 5x + 6}$$

$$\frac{(x+3)(x-5)}{3(x-1)} \cdot \frac{(x-1)}{(x+3)(x+2)} = \frac{x-5}{3(x+2)}$$

Example 7:

Diff. of Squares

$$\frac{x^2 - 4x - 5}{5x + 5} \div \frac{x^2 - 25}{2x}$$

$$\frac{x^2 - 4x - 5}{5x + 5} \cdot \frac{2x}{x^2 - 25}$$

$$\frac{(x+1)(x-5)}{5(x+1)} \cdot \frac{2x}{(x+5)(x-5)} = \frac{2x}{5(x+5)}$$

Example 8:

$$\frac{x^2 + 5x - 14}{2x^2} \div \frac{(x+7)}{1}$$

$$\frac{(x+7)(x-2)}{2x^2} \cdot \frac{1}{x+7} = \frac{x-2}{2x^2}$$