

Chapter 6 Notes  
Rational Expressions

**Simplifying Rational Expressions**

1. Factor the numerator and the denominator.
2. Cancel any common factors.

Example:

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

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

$$\frac{x - y}{2x - y}$$

**Multiplying/Dividing Rational Expressions**

1. If a division problem, change to a multiplication problem by replacing the term after the division sign with its reciprocal.
2. Factor the numerators and denominators of all expressions.
3. Cancel any common factors.
4. Multiply the numerators. Multiply the denominators.
5. Make sure answer is in lowest terms.

Example:

$$\frac{x^2 - 25}{2x - 2} \div \frac{x^2 + 10x + 25}{x^2 + 4x - 5}$$

$$\frac{x^2 - 25}{2x - 2} \cdot \frac{x^2 + 4x - 5}{x^2 + 10x + 25}$$

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

$$\frac{x - 5}{2}$$

## Adding/Subtracting Rational Expressions

1. Find the LCD.
  - a. Factor both denominators.
  - b. List the factors of the first denominator.
  - c. Add to this list any factors of the 2<sup>nd</sup> denominator that does not appear in the list.
  - d. Form the product of each different factor from the list. This product is the LCD.
2. Rewrite each fraction as  $\frac{?}{LCD}$ .
3. Add/subtract the new numerators.
4. Make sure answer is in lowest terms.

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

1. Find LCD.

$$x^2 - x - 6 = (x-3)(x+2)$$

$$x^2 - 9 = (x-3)(x+3)$$

$$LCD = (x-3)(x+2)(x+3)$$

2. Re write each fraction.

$$\frac{3x-2}{x^2-x-6} = \frac{?}{(x-3)(x+2)(x+3)}$$

$$\begin{aligned} \frac{3x-2}{(x-3)(x+2)} &= \frac{(3x-2)(x+3)}{(x-3)(x+2)(x+3)} \\ &= \frac{3x^2 + 7x - 6}{(x-3)(x+2)(x+3)} \end{aligned}$$

$$\frac{4x-3}{x^2-9} = \frac{?}{(x-3)(x+2)(x+3)}$$

$$\begin{aligned} \frac{4x-3}{(x+3)(x-3)} &= \frac{(4x-3)(x+2)}{(x-3)(x+2)(x+3)} \\ &= \frac{4x^2 + 5x - 6}{(x-3)(x+2)(x+3)} \end{aligned}$$

3. Add numerators.

$$\begin{aligned} &\frac{3x^2 + 7x - 6}{(x-3)(x+2)(x+3)} + \frac{4x^2 + 5x - 6}{(x-3)(x+2)(x+3)} \\ &\frac{7x^2 + 12x - 12}{(x-3)(x+2)(x+3)} \end{aligned}$$

4. Lowest terms