Rational Expressions and Equations Lesson #3:
Addition and Subtraction of Rational Expressions - Part One

| **Review** | *Addition and Subtraction of Rational Numbers* |

Recall the following steps for adding or subtracting rational numbers.

1. Determine the lowest common denominator (LCD) for the rational numbers.

2. Express each rational number as an equivalent rational number with the LCD as the denominator.

3. Combine the rational numbers by adding/subtracting numerators.

4. Reduce to lowest terms, if possible.

Class Ex. #1

Add or subtract as indicated.

a) $\dfrac{2}{3} + \dfrac{2}{5}$

b) $\dfrac{5}{6} - \dfrac{1}{4}$

c) $\dfrac{7}{8} - \dfrac{2}{3} + \dfrac{5}{12}$

Addition/Subtraction of Single Variable Rational Expressions

The method for adding and subtracting rational expressions is identical to the method described for adding and subtracting rational numbers. Recall that when we deal with rational expressions with a variable in the denominator, there are restrictions on the variable.
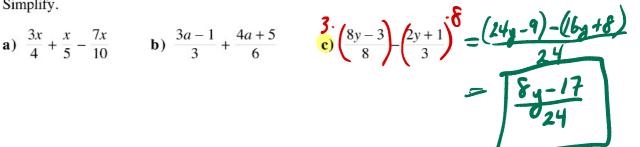
Addition/Subtraction with Non-Variable Denominators

Class Ex. #2

Simplify.

a) $\dfrac{3x}{4} + \dfrac{x}{5} - \dfrac{7x}{10}$

b) $\dfrac{3a-1}{3} + \dfrac{4a+5}{6}$

c) $\overset{3}{\left(\dfrac{8y-3}{8}\right)} - \left(\dfrac{2y+1}{3}\right)^{\!8} = \dfrac{(24y-9)-(16y+8)}{24}$

$$= \boxed{\dfrac{8y-17}{24}}$$

Addition/Subtraction with Different Monomial/Binomial Denominators

In this section, we will add or subtract rational expressions with monomial or binomial denominators with no factor in common.

Class Ex. #6 Simplify. Express answers in lowest terms, and indicate nonpermissible values.

a) $\dfrac{(x-9)}{2x} + \dfrac{(3x)}{x-4}$ b) $\dfrac{4}{2y+5} - \dfrac{1}{y-3}$ c) $\dfrac{2x+1}{x-5} - \dfrac{x-4}{x+1}$

(handwritten annotations on part a) $(x-4)$ $2x$

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

$$= \frac{x^2 - 13x + 36 + 6x^2}{2x(x-4)}$$

$$= \frac{7x^2 - 13x + 36}{2x(x-4)}$$

$$x \neq 0, 4$$

Class Ex. #7 Perform the indicated operation. State the nonpermissible values.

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

$$= \frac{3x^2 + 3x - 2x^2 - 4x + x^2 + 3x + 2}{x(x+1)(x+2)}$$

$$= \frac{2x^2 + 2x + 2}{x(x+1)(x+2)} = \boxed{\frac{2(x^2 + x + 1)}{x(x+1)(x+2)}}$$

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

Complete Assignment Questions #7 - #12 $\boxed{\#1 - 8 \ (a, c)}$