

# Adding and Subtracting Rational Expressions Notes

## Adding and Subtracting Rational Expressions

**Addition of fraction** depends on the kinds of denominator the fraction have.

1. To add two fractions with the same denominator, use  $\frac{a}{b} + \frac{b}{c} = \frac{a+b}{c}$ .
2. To add two fraction with different denominators, use  $\frac{a}{b} + \frac{c}{d} = \frac{ad+bc}{bd}$ .

## Least Common Denominator

The **least common denominator**, or simply LCD, of a set fraction is the least common multiple of the denominators of the given fractions.

**Sample Problem 1:** Add or subtract the following rational expressions with the same denominator.

$$1. \frac{2x-1}{x^2} + \frac{4x+1}{x^2}$$

Solution:

$$\frac{2x-1}{x^2} + \frac{4x+1}{x^2} = \frac{2x-1+4x+1}{x^2} = \frac{6x}{x^2} = \frac{6}{x}$$

$$3. \frac{5x+7}{2x+2} - \frac{3x-1}{2x+2}$$

Solution:

$$\begin{aligned} \frac{5x+7}{2x+2} - \frac{3x-1}{2x+2} &= \frac{(5x+7)-(3x-1)}{2x+2} \\ &= \frac{5x+7-3x+1}{2x+2} = \frac{2x+8}{2x+2} = \frac{\cancel{2}(x+4)}{\cancel{2}(x+1)} = \frac{x+4}{x+1} \end{aligned}$$

$$2. \frac{5}{24x} - \frac{7}{24x}$$

Solution:

$$\frac{5}{24x} - \frac{7}{24x} = \frac{5-7}{24x} = -\frac{2}{24x} = -\frac{1}{12x}$$

$$4. \frac{3x+17}{x+5} + \frac{x+7}{x+5}$$

Solution:

$$\frac{3x+17}{x+5} + \frac{x+7}{x+5} = \frac{3x+17+x+7}{x+5} = \frac{4x+24}{x+5}$$

**Sample Problem 2:** Add or subtract the rational expressions with different denominator.

$$5. \frac{7}{6xy^2} + \frac{2}{15x^2y}$$

Solution:

LCD:  $30x^2y^2$

$$\frac{7}{6xy^2} + \frac{2}{15x^2y} = \frac{7(5x)+2(2y)}{30x^2y^2} = \frac{35x+4y}{30x^2y^2}$$

$$6. \frac{5}{v+4} - \frac{4}{v-5}$$

Solution:

LCD:  $(v+4)(v-5) = v^2 - v - 20$

$$\begin{aligned} \frac{5}{v+4} - \frac{4}{v-5} &= \frac{5(v-5)-4(v+4)}{v^2-v-20} \\ &= \frac{5v-25-4v-16}{v^2-v-20} = \frac{v-41}{v^2-v-20} \end{aligned}$$

$$7. \frac{3y}{y+1} + \frac{2y}{y-1}$$

Solution:

LCD:  $(y+1)(y-1) = y^2 - 1$

$$\begin{aligned} \frac{3y}{y+1} + \frac{2y}{y-1} &= \frac{3y(y-1)+2y(y+1)}{y^2-1} \\ &= \frac{3y^2-3y+2y^2+2y}{y^2-1} = \frac{5y^2-y}{y^2-1} \end{aligned}$$

$$8. \frac{3x}{x-3} - \frac{x+4}{x+2}$$

Solution:

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

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