

6.3 Adding & Subtracting Rational Expressions

We can add & subtract rational expressions just like we would with fractions, so the fractions must have a common denominator

e.g. $\frac{7}{10} - \frac{3}{10} \rightarrow \frac{4}{10} \rightarrow \frac{2}{5}$

don't add or subtract the denominators!

Example 1: p.333

a) $\frac{2x}{x+4} + \frac{8}{x+4}$

$$= \frac{2x+8}{x+4}$$

$$= \frac{2(x+4)}{x+4} \rightarrow \underline{\underline{2}}$$

b) $\frac{x^2}{x-2} + \frac{3x}{x-2} - \frac{10}{x-2}$

$$= \frac{x^2+3x-10}{x-2}$$

$$= \frac{(x+5)(x-2)}{(x-2)} \rightarrow \underline{\underline{x+5}}$$

When we start with different denominators, we can find 3 cases:

A) LCD is one of the denominators

e.g. $\frac{1}{4} + \frac{3}{8} = \frac{1}{4}(\frac{2}{2}) + \frac{3}{8}$

$$= \frac{2}{8} + \frac{3}{8} \rightarrow \frac{5}{8}$$

Multiply 1st fraction by 1 ($\frac{2}{2}$) to achieve common denom.

B) Denominators have no common factor, so LCD = product

e.g. $\frac{2}{3} + \frac{4}{5} = \frac{2}{3}(\frac{5}{5}) + \frac{4}{5}(\frac{3}{3})$

$$= \frac{10}{15} + \frac{12}{15}$$

$$= \underline{\underline{\frac{22}{15}}}$$

Multiply both fractions by 1 to achieve common denom.

C) Denominators do have a common factor, so LCD = Product $\div$ Common factors

e.g. $\frac{5}{6} - \frac{2}{15} = \frac{5}{6}(\frac{5}{5}) - \frac{2}{15}(\frac{2}{2})$

$$= \frac{25}{30} - \frac{4}{30}$$

$$= \frac{21}{30} \rightarrow \underline{\underline{\frac{7}{10}}}$$

e.g. $\frac{6 \times 15}{3} \rightarrow \underline{\underline{30}}$

Now consider the same operations with rational expressions – remember to factor first!

Example 2: Add or subtract, then simplify. Remember to include non-permissible values.

$$\begin{aligned} \text{a) } & \frac{4}{x^2-9} + \frac{6}{x+3} & \text{LCD} &= (x+3)(x-3) \\ & = \frac{4}{(x+3)(x-3)} + \frac{6}{(x+3)} \left(\frac{x-3}{x-3} \right) \\ & = \frac{4 + 6x - 18}{(x+3)(x-3)} \longrightarrow \frac{6x-14}{(x+3)(x-3)} \text{ or } \frac{2(3x-7)}{(x+3)(x-3)} \\ & & & x \neq \pm 3 \end{aligned}$$

$$\begin{aligned} \text{b) } & \frac{2}{5x} - \frac{1}{4y} & \text{LCD} &= 20xy \\ & = \frac{2}{5x} \left(\frac{4y}{4y} \right) - \frac{1}{4y} \left(\frac{5x}{5x} \right) \\ & = \frac{8y - 5x}{20xy} & & x \neq 0, y \neq 0 \end{aligned}$$

$$\begin{aligned} \text{c) } & \frac{6}{x^2+x-30} - \frac{4}{x^2-25} & \text{LCD} &= (x+5)(x-5)(x+6) \\ & = \frac{6}{(x+6)(x-5)} - \frac{4}{(x+5)(x-5)} \\ & = \frac{\cancel{(x+5)} \frac{6}{\cancel{(x+5)}}}{(x+6)(x-5)} - \frac{4}{(x+5)(x-5)} \left(\frac{x+6}{x+6} \right) \\ & = \frac{6x+30 - 4(x+6)}{(x+5)(x+6)(x-5)} \\ & = \frac{6x+30-4x-24}{(x+5)(x+6)(x-5)} \longrightarrow \frac{2x+6}{(x+5)(x+6)(x-5)} & & x \neq \pm 5, -6 \end{aligned}$$

Assignment: p. 336

Day 1 #1, 3, 5-8

Day 2 #9, 10, 12, 15, 16, 18