2.2B Operations with Rational Expressions (Adding and Subtracting)

A concrete example:

$$\frac{3}{4}+\frac{7}{4}$$

$$=\frac{10}{4}$$

A concrete example:

$$\frac{7}{9}-\frac{5}{6}$$

Common Denom 18

$$=\frac{14}{18}-\frac{15}{18}$$

$$=-\frac{1}{18}$$

Ex. 1 Simplify. State restrictions.

a) $\frac{3}{y^2}-\frac{2}{y^2}+\frac{6}{y^2}$

$$=\frac{3-2+6}{y^2}$$

$$=\frac{7}{y^2}, \quad y\neq 0$$

PROCESS
1. Find the lowest common denominator and create equivalent rational expressions.
2. Add or subtract the numerators but do not change the denominators.
3. Reduce by any common factors.
4. State the restrictions.

b) $\frac{(5x-1)}{6}-\frac{(7x+2)}{4}$

$$=\frac{10x-2}{12}-\frac{21x+6}{12}$$

Careful!

$$=\frac{10x-2-(21x+6)}{12}$$

$$=\frac{10x-2-21x-6}{12}$$

$$=\frac{-11x-8}{12}$$

c) $\frac{5}{x^2-4}-\frac{3}{4-x^2}\frac{(-1)}{(-1)}$

x^2 - 4 and 4 - x^2 are opposites!

$$=\frac{5}{x^2-4}-\frac{-3}{x^2-4}$$

$$=\frac{5-(-3)}{x^2-4}$$

$$=\frac{8}{(x+2)(x-2)}, \quad x\neq \pm 2$$

Finding the LCD

$4x^3 = 4 \cdot 2 \quad x \cdot x \cdot x$

$8x = 8 \quad x \cdot x \cdot x$

$8x^3$

THINK Factors must divide evenly into multiples.

Ex. 2 Simplify and state the restrictions.

PROCESS
1. Find the lowest common denominator and create equivalent rational expressions.
2. Add or subtract the numerators but do not change the denominators.
3. Reduce by any common factors.
4. State the restrictions.

a) $\frac{2(4x-1)}{2 \cdot 4x^3} - \frac{(1+3x)}{8x} \cdot \frac{x^2}{x^2}$

$= \frac{2(4x-1)}{8x^3} - \frac{(1+3x)x^2}{8x^3}$

$= \frac{8x-2-(x^2+3x^3)}{8x^3}$

$= \frac{8x-2-x^2-3x^3}{8x^3}$

$= \frac{-3x^3-x^2+8x-2}{8x^3}, x \neq 0$

b) $\frac{4x+4}{5x^2+15x+10} + \frac{1}{x+3}$ ← FACTOR!

$= \frac{4(x+1)}{5(x^2+3x+2)} + \frac{1}{x+3}$

$= \frac{(x+3)\,4(x+1)}{(x+3)\,5(x+2)(x+1)} + \frac{1}{x+3} \cdot \frac{5(x+1)(x+2)}{5(x+1)(x+2)}$

$= \frac{4(x+1)(x+3)}{5(x+1)(x+2)(x+3)} + \frac{5(x+1)(x+2)}{5(x+1)(x+2)(x+3)}$

$= \frac{4\cancel{(x+1)}(x+3) + 5\cancel{(x+1)}(x+2)}{5\cancel{(x+1)}(x+2)(x+3)}$

$= \frac{4x+12+5x+10}{5(x+2)(x+3)}$

$= \frac{9x+22}{5(x+2)(x+3)}, x \neq -2, -3, -1$

c) $\dfrac{x-2}{x+1} - \dfrac{3-12x}{2x^2-x-3}$

$(2x-3)$

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

M -6

A -1

$-\frac{3}{2}$ $\frac{2}{2}$

$\frac{1}{1}$

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

$= \dfrac{2x^2-7x+6}{(2x-3)(x+1)} - \dfrac{3-12x}{(2x-3)(x+1)}$

$= \dfrac{2x^2+5x+3}{(2x-3)(x+1)}$

M 6

A 5

$\frac{2}{2}$ $\frac{3}{2}$

$\frac{1}{1}$

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

$= \dfrac{2x+3}{2x-3}, \; x \neq \frac{3}{2}, -1$

d) $\dfrac{7}{6x-6} + \dfrac{2x^2}{(x-1)^2} \div \dfrac{4x}{x^2-1}$

FIRST!

Because BEDMAS

HOMEWORK
Pg. 128 # 1ac, 3, 5a, 6ad, 7c, 8b, 10c

+ Additional HW Handout Lesson 2.2B