

ADDING AND SUBTRACTING RATIONAL NUMBERS

To add or subtract rational expressions we need to find the Lowest Common Denominator:

Ex1. $\frac{5(3x-1)}{5(3)} - \frac{3(2x+2)}{3 \cdot 5}$ LCD 3 and 5 = 15

$$= \frac{5(3x-1)}{15} - \frac{3(2x+2)}{15}$$

$$= \frac{5(3x-1) - 3(2x+2)}{15}$$

$$= \frac{15x - 5 - 6x - 6}{15}$$

$$= \frac{9x - 11}{15}$$

Ex2. $\frac{5(2x-3)}{5 \cdot 4} + \frac{4(3x-1)}{4 \cdot 5} - \frac{10(x-5)}{10 \cdot 2}$ LCD 4, 8, 12, 16, 20
 5, 10, 15, 20
 2.....20

$$= \frac{5(2x-3) + 4(3x-1) - 10(x-5)}{20}$$

$$= \frac{10x - 15 + 12x - 4 - 10x + 50}{20}$$

$$= \frac{12x + 31}{20}$$

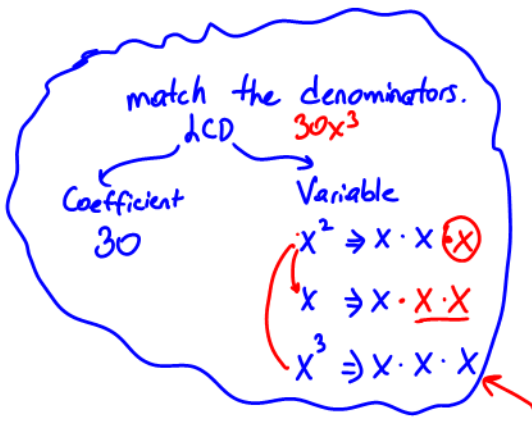
Ex3. $\frac{10x}{10x} \cdot \frac{5}{3x^2} - \frac{1}{2x} + \frac{3}{5x^3}$

$$= \frac{10x \cdot 5}{10x \cdot 3x^2} - \frac{15x^2 \cdot 1}{15x^2 \cdot 2x} + \frac{6 \cdot 3}{6 \cdot 5x^3}$$

$$= \frac{50x}{30x^3} - \frac{15x^2}{30x^3} + \frac{18}{30x^3}$$

$$= \frac{50x - 15x^2 + 18}{30x^3}$$

$$= \frac{-15x^2 + 50x + 18}{30x^3}$$



Restriction $x \neq 0$

Ex4. $\frac{3x - 12}{x^2 - x - 12} - \frac{2}{x^2 + 6x + 9} - \frac{1}{x^2 - 4x - 21}$

factor each expression to see if you can simplify

$$= \frac{3\cancel{(x-4)}}{(x+3)\cancel{(x-4)}} - \frac{2}{(x+3)(x+3)} - \frac{1}{(x+3)(x-7)}$$

Restriction
 $x \neq -3, 4 \text{ and } 7$

$$= \frac{(x+3)\cancel{(x-7)}3}{(x+3)\cancel{(x-7)}(x+3)} - \frac{(x-7)2}{\cancel{(x-7)}(x+3)(x+3)} - \frac{(x+3)1}{(x+3)(x-7)}$$

match 1st, 2nd
then
LCD

$$= \frac{3(x+3)(x-7)}{(x+3)(x+3)(x-7)} - \frac{2(x-7)}{(x+3)(x+3)(x-7)} - \frac{(x+3)}{(x+3)(x+3)(x-7)}$$

$$= \frac{3(x+3)(x-7) - 2(x-7) - 1(x+3)}{(x+3)(x+3)(x-7)}$$

Expand

$x \neq -3 \text{ and } 7$

$$= \frac{3(x^2 - 7x + 3x - 21) - 2x + 14 - x - 3}{(x+3)(x+3)(x-7)}$$

$$= \frac{3(x^2 - 4x - 21) - 3x + 11}{(x+3)(x+3)(x-7)}$$

$$= \frac{3x^2 - 12x - 63 - 3x + 11}{(x+3)(x+3)(x-7)}$$

$$= \frac{3x^2 - 15x - 52}{(x+3)(x+3)(x-7)} \quad x \neq -3, 4 \text{ and } 7$$

Practice

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

2) $\frac{6}{x+4} + \frac{5}{x}$

3) $\frac{7}{2y-1} - \frac{3}{1-2y}$

4) $7 + \frac{3m}{m-4} - \frac{m}{m+2}$

5) $\frac{2x}{x-y} - \frac{3y}{x+y} + 1$

6) $\frac{1 + \frac{2}{x} - \frac{3}{x^2}}{2 - \frac{1}{x} - \frac{1}{x^2}}$