Add & Subtract Rational Expressions

Unit 8 Day 2

What is $\frac{1}{5}+\frac{2}{5}$?

Adding rational expressions works the same way!

$$\frac{4}{2x}+\frac{3}{2x}=\frac{7}{2x}$$

This works because we already have a

common denominator.

10) $\dfrac{x^3-9x}{x^2+6x+9} \cdot \dfrac{x^3+3x^2}{3-x} = -x^3$

$-1x\,\cancel{(x+3)}\cancel{(x-3)}$

$x(x^2-9)$

$x^2\cancel{(x+3)}$

$\cancel{(x+3)}\cancel{(x+3)}$

Practice adding rational expressions that already have a common denominator:

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

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

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

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

Be sure to simplify your answer!

The Basic RULE for Adding and Subtracting Fractions:

Get a Common Denominator!

Examine the basic process:

Add: $\frac{1}{3}+\frac{3}{4}$

Get a common denominator - the smallest number that both denominators can divide **into** without remainders. In this case, the number is 12.

To change the denominator of 3 into 12 requires multiplying by **4**. To change the denominator of 4 into 12 requires multiplying by **3**.

With each fraction, whatever is multiplied times the bottom must ALSO be multiplied times the top.

$$\frac{1}{3}\cdot\frac{4}{4}+\frac{3}{4}\cdot\frac{3}{3}$$

$$\frac{4}{12}+\frac{9}{12}=\frac{13}{12}$$

Practice adding rational expressions that already have unlike denominators:

LCD ⇒ 6x

4. $\frac{(x)1}{(x)6} + \frac{(2x+1)(2)}{3x(2)}$

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

5. $\dfrac{3(x-5)}{(x-5)(x)} - \dfrac{2(x)}{(x-5)(x)}$

LCD $\Rightarrow x(x-5)$

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

$$\frac{x-15}{x(x-5)}$$

6. $\frac{7}{x+4} - \frac{2}{1}$

LCD $\Rightarrow x+4$

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

$\frac{7-2x-8}{x+4} = \frac{-2x-1}{x+4}$

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

LCD ⇒ $(x+5)(x-1)$

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

1·2 1·15 3·5

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

8. $\frac{(x+1)(6x+4)}{(x+1)(x-1)} + \frac{5}{(x+1)(x-1)}$

LCD $\Rightarrow (x-1)(x+1)$

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

$\frac{6x^2+10x+9}{(x-1)(x+1)}$

9. $\frac{(x-2)2}{(x-2)(x+3)} + \frac{(-x+1)(x+3)}{x-2} + \frac{4}{x^2+x-6}$

$(x+3)(x-2)$

LCD $\Rightarrow (x+3)(x-2)$

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

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

10. $\dfrac{7(x+1)}{(x+1)9x^2} + \dfrac{x(3x)}{3x(x+1)(3x)}$

LCD $\Rightarrow 9x^2(x+1)$

$$\frac{7x+7+3x^2}{9x^2(x+1)} = \frac{3x^2+7x+7}{9x^2(x+1)}$$

LCD $\Rightarrow (x+2)^2(x-2)$

11. $\dfrac{(x-2)(x+1)}{x^2+4x+4} + \dfrac{6(x+2)}{x^2-4}$

$(x+2)(x+2)$ $(x+2)(x-2)(x+2)$

$(x-2)(x+2)^2$

$$\frac{\cancel{x^2}+\cancel{x}-\cancel{2x}-2+\cancel{6x}+12}{(x+2)^2(x-2)}$$

$$\frac{x^2+5x+10}{(x+2)^2(x-2)}$$