

**3-2 Notes: Adding and Subtracting Rational Expressions**

In order to add or subtract two rational expressions you need a common denominator.

Warm-Up: Add or subtract the following:

$\frac{1}{4} - \frac{8}{9} = \frac{1}{4} \cdot \frac{9}{9} - \frac{8}{9} = \frac{9}{36} - \frac{32}{36} = \frac{-23}{36}$ 
 $\frac{7}{7} \cdot \frac{3}{5} + \frac{1}{7} \cdot \frac{5}{5} = \frac{21}{35} + \frac{5}{35} = \frac{26}{35}$

LCD: least common denominator

Find the LCD of the following:

$\frac{x}{4} \cdot \frac{4}{4} \cdot \frac{1}{6x^2}$  and  $\frac{1}{8x^3} \cdot \frac{3}{3}$ 
 $\frac{4x}{24x^3}$  and  $\frac{3}{24x^3}$

$\frac{(x-7)}{(x-7)} \cdot \frac{1}{(x+3)(x+5)}$  and  $\frac{1}{(x+3)(x-7)} \cdot \frac{(x+5)}{(x+5)}$ 
 $\frac{(x-7)}{(x+3)(x+5)(x-7)}$  and  $\frac{(x+5)}{(x+3)(x+5)(x-7)}$

Adding and Subtracting: Perform the operation and simplify. Don't forget to state the excluded values.

$\frac{2m+4n}{30m^3} - \frac{m-3n}{30m^3}$

$\frac{m+7n}{30m^3}$   $m \neq 0$

$\frac{2x}{15x^3} + \frac{6}{3x^2} \cdot \frac{5x}{5x}$

$\frac{2x}{15x^3} + \frac{30x}{15x^3}$ 
 $\frac{32x}{15x^3} = \frac{32}{15x^2}$ 
 $x \neq 0$

$\frac{5n}{2n-4} + \frac{6}{n-2} \cdot \frac{2}{2}$

$\frac{5n}{2n-4} + \frac{12}{2n-4}$ 
 $\frac{5n+12}{2n-4}$ 
 $n \neq 2$

$\frac{(b-2)(b-1) \cdot 3b}{(b-2)(b-1) \cdot 2b} + \frac{2b}{(b-2)(b-1)} \cdot \frac{2}{2}$

$b \neq 0, 2, 1$

$\frac{3(b-2)(b-1) + 4b}{(2)(b-2)(b-1)}$

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

$= \frac{3b^2 - 9b + 6 + 4b}{(2)(b-2)(b-1)}$   $\frac{3b^2 - 5b + 6}{2(b-2)(b-1)}$

$\frac{n-b}{n-b} \cdot \frac{4}{n+6} - \frac{5}{n-6} \cdot \frac{n+b}{n+b}$

$\frac{4(n-b) - 5(n+b)}{(n+b)(n-b)}$

$\frac{4n - 24 - 5n - 30}{(n+b)(n-b)}$

$\frac{-n - 54}{(n+b)(n-b)}$   $n \neq b, -6$

$\frac{bx}{bx} \cdot \frac{2}{x^2-16} + \frac{6}{6x} \cdot \frac{(x-4)(x+4)}{(x-4)(x+4)}$

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

$\frac{2x + x^2 - 16}{(x)(x-4)(x+4)}$

$\frac{x^2 + 2x - 16}{(x)(x-4)(x+4)}$   $x \neq 4, -4, 0$

**Adding and Subtracting:** Perform the operation and simplify. Don't forget to state the excluded values.

$$\left( \frac{x}{2} + \frac{x^2}{4} \right) \quad \frac{2}{2} \cdot \frac{x}{2} + \frac{x^2}{4} = \frac{2x+x^2}{4}$$

$$\frac{\frac{4}{2x+x^2}}{\frac{4}{4}} = \frac{4}{1} \cdot \frac{4}{2x+x^2} = \frac{16}{2x+x^2} = \boxed{\frac{16}{x(2+x)}}$$

$$\boxed{x \neq 0, -2}$$

$$\left( \frac{x-3}{x} + \frac{x-1}{x-3} \right) \cdot \frac{x^2-x}{x-3} \quad \frac{(x-3)}{(x-3)} \cdot \frac{(x-3)}{x} + \frac{(x-1)}{(x-3)} \cdot \frac{x}{x} = \frac{(x-3)^2 + x(x-1)}{x(x-3)}$$

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

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

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

$$\boxed{x \neq 0, 3, 1}$$

$$\frac{2}{1} - \frac{x+3}{2x^5 - 2x^4 - 40x^3}$$

$$2x^3(x^2 - x - 20)$$

$$2x^3(x-5)(x+4)$$

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

$$\boxed{x \neq 0, 5, -4}$$