

March 6

Add/Subtract Rational Expressions With Different Denominators

(Ex) Simplify: $\frac{5}{v+3} + \frac{5}{v^2-9}$

$$\begin{aligned} v^2-9 \\ \sqrt{v^2}=v \quad \sqrt{9}=3 \\ (v+3)(v-3) \end{aligned}$$

step 1: Factor denominator (bottom) ONLY!

$$\frac{5}{(v+3)} + \frac{5}{(v+3)(v-3)}$$

step 2: Find LCD:

$$\text{LCD: } (v+3)(v-3)$$

step 3: Make fractions have LCD.

$$\frac{5(v-3)}{(v+3)(v-3)} \Rightarrow \frac{5v-15}{(v+3)(v-3)}$$

step 4: Put back in "fixed" fractions. Finish problem.

$$\frac{(5v-15)}{(v+3)(v-3)} + \frac{5}{(v+3)(v-3)}$$

$$\frac{(5v-15)+5}{(v+3)(v-3)}$$

$$\frac{5v-15+5}{(v+3)(v-3)}$$

$$\frac{5v-10}{(v+3)(v-3)}$$

$$\frac{5(v-2)}{(v+3)(v-3)}$$

$$\frac{5v-10}{5 \quad 5} \quad \text{GCF: } 5 \\ \frac{5(v-2)}{5 \quad 5}$$

Ex2 Simplify: $\frac{2}{(x+3)} - \frac{5}{(x+4)}$

LCD: $(x+3)(x+4)$

$$\frac{2(x+4)}{(x+3)(x+4)} \Rightarrow \frac{2x+8}{(x+3)(x+4)}$$

$$\frac{5(x+3)}{(x+4)(x+3)} \Rightarrow \frac{5x+15}{(x+3)(x+4)}$$

$$\frac{(2x+8)}{(x+3)(x+4)} - \frac{(5x+15)}{(x+3)(x+4)}$$

$$\frac{(2x+8) - (5x+15)}{(x+3)(x+4)}$$

$$\frac{2x+8-5x-15}{(x+3)(x+4)}$$

$$\boxed{\frac{-3x-7}{(x+3)(x+4)}}$$

Ex3 Simplify: $\frac{2x+5}{x^2+x-20} - \frac{x+3}{x^2-16}$

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

LCD: $(x-4)(x+5)(x+4)$

$$\frac{(2x+5)(x+4)}{(x-4)(x+5)(x+4)} \Rightarrow \frac{2x^2+8x+5x+20}{(x-4)(x+5)(x+4)} \Rightarrow \frac{2x^2+13x+20}{(x-4)(x+5)(x+4)}$$

$$\frac{(x+3)(x+5)}{(x+4)(x-4)(x+5)} \Rightarrow \frac{x^2+5x+3x+15}{(x-4)(x+5)(x+4)} \Rightarrow \frac{x^2+8x+15}{(x-4)(x+5)(x+4)}$$

$$\frac{2x^2+13x+20}{(x-4)(x+5)(x+4)} - \frac{x^2+8x+15}{(x-4)(x+5)(x+4)}$$

$$\frac{(2x^2+13x+20) - (x^2+8x+15)}{(x-4)(x+5)(x+4)}$$

$$\frac{2x^2+13x+20-x^2-8x-15}{(x-4)(x+5)(x+4)}$$

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

x^2+5x+5
 $x^2 \cdot 5 = 5x^2$
 $\quad \quad \quad \uparrow$
 $\quad \quad \quad \quad \quad = 5x$

Multiply to 5
 $\frac{\quad}{+5 \quad +5}$

DNF

$x^2+x(-20)$
 $x^2-20 = -20x^2$
 $\quad \quad \quad \uparrow$
 $\quad \quad \quad -4x + 5x = 1x$
 $\frac{x^2-4x}{x} + \frac{5x-20}{5}$
 $x(x-4) \mid 5(x-4)$
 $(x-4)(x+5)$

x^2-16
 $\sqrt{x^2} = x \quad \sqrt{16} = 4$
 $(x+4)(x-4)$

Ex4 Simplify: $\frac{7}{3x^4y^7} + \frac{1}{8x^5y^3}$

3: 3, 6, 9, 12, 15, 18, 21, 24

8: 8, 16, 24, 32, 40

LCD: $24x^5y^7$

$$\frac{7 \cdot 8x}{3x^4y^7 \cdot 8x} \Rightarrow \frac{56x}{24x^5y^7}$$

$$\frac{1 \cdot 3y^4}{8x^5y^3 \cdot 3y^4} \Rightarrow \frac{3y^4}{24x^5y^7}$$

$$\frac{56x}{24x^5y^7} + \frac{3y^4}{24x^5y^7}$$

$$\frac{56x + 3y^4}{24x^5y^7}$$