

October 23

## Add Rational Expressions

When adding (or subtracting) fractions, they must have a common denominator.

EX1

$$\frac{6x}{x^2+4x-5} + \frac{30}{x^2+4x-5}$$

Step 1: Factor denominator only!

$$\begin{array}{r} x^2 + 4x - 5 \\ x \quad x \quad | \quad 1 \quad -1 \\ \hline x(x+5) - 1(x+5) \\ \hline (x+5)(x-1) \end{array}$$

$$x^2 - 5 = -5x^2$$

$$5x + -1x = 4x$$

Step 2: Replace.

$$\frac{6x}{(x+5)(x-1)} + \frac{30}{(x+5)(x-1)}$$

Step 3: Make sure you have common denominators.

Step 4: Add numerators. Keep common denominator.

$$\frac{6x+30}{(x+5)(x-1)}$$

Step 5: Simplify. (Factor numerator, and cancel.)

$$\frac{6\cancel{(x+5)}}{\cancel{(x+5)}(x-1)}$$

$$\frac{\cancel{6}x+30}{\cancel{6} \quad 6} \\ 6(x+5)$$

$$\boxed{\frac{6}{x-1}}$$

Ex 2

$$\frac{2x+3}{2x^2-7x-4} + \frac{x+2}{2x^2-7x-4}$$

$$\begin{array}{r|l} 2x^2 - 7x - 4 & \\ \hline 2x^2 - 8x & +1x - 4 \\ \hline 2x(x-4) & 1(x-4) \\ \hline & (x-4)(2x+1) \end{array}$$

$$2x^2 - 4 = -8x^2$$

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

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

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

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

3x+5  
does not factor

Ex 3

$$\frac{-3x^2 + 7}{x^2 - 5x - 24} + \frac{4x^2 - 16}{x^2 - 5x - 24}$$

$$\begin{array}{r}
 x^2 - 5x - 24 \\
 x^2 - 8x + 3x - 24 \\
 \hline
 x \quad x \quad 3 \quad 3 \\
 x(x-8) \quad 3(x-8) \\
 \hline
 (x-8)(x+3)
 \end{array}$$

$$x^2 - 24 = -24x^2$$

$$\frac{-8x + 3x}{(x-8)(x+3)} = -5x$$

$$\frac{-3x^2 + 7}{(x-8)(x+3)} + \frac{4x^2 - 16}{(x-8)(x+3)}$$

$$\frac{-3x^2 + 7 + 4x^2 - 16}{(x-8)(x+3)}$$

$$\frac{x^2 - 9}{(x-8)(x+3)}$$

$$\begin{array}{l}
 x^2 - 9 \\
 \sqrt{x^2} = x \quad \sqrt{9} = 3 \\
 (x+3)(x-3)
 \end{array}$$

$$\frac{\cancel{(x+3)}(x-3)}{(x-8)\cancel{(x+3)}}$$

$$\boxed{\frac{x-3}{x-8}}$$