

6.2 } Add/Subtract Rational Expressions

$$\frac{5x+1}{x^2-9} - \frac{4x-2}{x^2-9}$$

} same denominator

* You need a common denominator
(Just like fractions)

$$\frac{5x+1}{x^2-9} - \frac{4x-2}{x^2-9}$$

$$\frac{3}{5} + \frac{1}{5} = \frac{3+1}{5}$$

$$\frac{5x+1 - (4x-2)}{x^2-9}$$

subtract the
whole 2nd term

$$\frac{5x+1-4x+2}{x^2-9}$$

$$= \frac{x+3}{x^2-9} \left. \begin{array}{l} \text{Now} \\ \text{factor} \end{array} \right\}$$

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

$$= \frac{1}{x-3}$$

Practice 1, p 349

$$\frac{9+x}{11z^2}$$

$$\frac{x+9}{11z^2}$$

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

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

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

$$\boxed{x-4}$$

Finding the Least common Denominator, p. 349
- 350:

$$\textcircled{a} \quad \overline{6x^3y^5} \quad \overline{9x^2y^4}$$

$$\text{LCD} = 18x^3y^5$$

$$\textcircled{b} \quad \frac{11}{x-2}, \quad \frac{x}{x+3}$$

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

$$\begin{aligned}
 & \textcircled{c} \quad \overline{b^2 - 16}, \quad \overline{b^2 - 8b + 16}, \quad \overline{2b^2 - 5b - 12} \\
 & (b+4)(\cancel{b-4}), \quad (\cancel{b-4})(b-4), \quad (\cancel{b-4})(\cancel{2b+3}) \\
 & (2b+3)(b-4)^2(b+4)
 \end{aligned}$$

$$\textcircled{d} \quad \frac{\quad}{y^2 - 9} \quad \frac{\quad}{12 - 4y}$$

$$-4y + 12$$

$$(y+3)(y-3) \quad -4(y-3)$$

$$\text{LCD} = -4(y-3)(y+3)$$

$$3 \frac{1}{4} + \frac{2}{3} 4$$

$$\frac{3+8}{12} = \frac{11}{12}$$

you multiply each fraction by what's missing to make the denominators = 12

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

$$\frac{3(x-2) + 2(x+2)}{(x-2)(x+2)} = \frac{3x-6+2x+4}{(x-2)(x+2)}$$

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

Add/Subtract with different denominators:

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

Step 1: factor denominators

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

Step 2 Are the denominators the same? No, so identify what is missing in each denominator.

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

missing 3

missing $x+4$

Step 3 | Multiply the terms
by the missing pieces

$$\frac{1}{(x+4)(x+1)} \cdot \frac{3}{3} + \frac{5x}{3(x+1)} \cdot \frac{x+4}{x+4}$$

$$\frac{1}{(x+4)(x+1)} \cdot \frac{3}{3} + \frac{5x}{3(x+1)} \cdot \frac{x+4}{x+4}$$

Step 4 Calculate the numerator only

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

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

$$\frac{x+2}{x+4}$$

Can't do this

$$\frac{x+2}{x+4} \neq \frac{x+1}{x+2} \text{ Does not work}$$

Plug in $x=3$

$$\frac{5}{7} \neq \frac{4}{5}$$

$$\frac{1}{x^2-4} + \frac{3}{x-2} \quad \left. \vphantom{\frac{1}{x^2-4} + \frac{3}{x-2}} \right\} \begin{array}{l} \text{Make denominators} \\ \text{equal} \end{array}$$

What's missing in denominators?

$$\frac{1}{(x+2)(x-2)} + \frac{3}{x-2} \quad \begin{array}{l} (x+2) \\ (x+2) \end{array}$$

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

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

$$\frac{7y}{5y^2-125} - \frac{4}{3y+15}$$

$$\frac{7y}{5(y^2-25)} - \frac{4}{3(y+5)}$$

$$\frac{7y}{5(y+5)(y-5)} \cdot \frac{3}{3} - \frac{4}{3(y+5)} \cdot \frac{5(y-5)}{5(y-5)}$$

$$\frac{7y}{5(y+5)(y-5)} \cdot \frac{3}{3} -$$

$$\frac{4}{3(y+5)} \cdot \frac{5(y-5)}{5(y-5)}$$

$$\frac{21y}{15(y+5)(y-5)} - \frac{4 \cdot (5y-25)}{15(y+5)(y-5)}$$

$$\frac{21y - 20y + 100}{15(y+5)(y-5)} = \frac{y + 100}{15(y+5)(y-5)}$$

$$\frac{4}{x^2-3x} + \frac{6}{3x-9}$$

$$\frac{4 \cdot 3}{x(x-3) \cdot 3} + \frac{6 \cdot x}{3(x-3) \cdot x}$$

$$\frac{12+6x}{3x(x-3)} = \frac{6x+12}{3x(x-3)} = \frac{6(x+2)}{3x(x-3)}$$

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