

## Adding/Subtracting Rational Expressions

### Adding and Subtracting with LIKE Denominators:

\*If subtraction, change ALL the signs of the NUMERATOR of the fraction behind it.

\*Add numerators—denominators stay the same!!!!

\*Factor & simplify if possible AFTER ADDITION!

Ex: Add or subtract.

$$1) \frac{2}{5x} + \frac{7}{5x} = \boxed{\frac{9}{5x}}$$

$$2) \frac{4x+1}{4x} - \frac{6x-11}{4x}$$

$$\frac{4x+1}{4x} + \frac{-6x+11}{4x} = \frac{-2x+12}{4x}$$

$$\frac{-2(x-6)}{2 \cdot 2x} = \boxed{\frac{-(x-6)}{2x}}$$

$$3) \frac{6x+5}{x^2-3} + \frac{3x-1}{x^2-3}$$

Add/subtract with unlike denominators

$$\frac{2}{3} + \frac{5}{6} = \frac{4}{6} + \frac{5}{6} = \frac{9}{6} = \frac{3}{2}$$

$$\frac{4}{5} + \frac{7}{10} = \frac{8}{10} + \frac{7}{10} = \frac{15}{10} = \frac{3}{2}$$

$$\frac{2}{6} + \frac{15}{6} = \boxed{\frac{17}{6}}$$

1) Factor each denominator.

2) Find the Least Common Multiple (LCM)—each factor must be represented

3) Convert each fraction to common denominator (i.e. multiply numerator by missing factor)

4) Add/subtract numerators, factor numerator, simplify if possible AFTER ADDITION

$$6) \frac{3n}{7} + \frac{n}{14}$$

$$\frac{6n}{14} + \frac{n}{14} = \frac{7n}{14} = \boxed{\frac{n}{2}}$$

$$7) \frac{5x+1}{3x} + \frac{3x+4}{2x}$$

$$\frac{10x+2}{6x} + \frac{9x+12}{6x}$$

$$\boxed{\frac{19x+14}{6x}}$$

$$\frac{(4-5) \cdot 3}{(a-5)(a+2)} + \frac{8 \cdot (a+2)}{(a-5)(a+2)}$$

$$\frac{3a-15}{(a-5)(a+2)} + \frac{8a+16}{(a-5)(a+2)}$$

$$\boxed{\frac{11a+1}{(a-5)(a+2)}}$$

$$8) \frac{6}{5x^2y} - \frac{5}{10xy^3}$$

$$\frac{12y^2}{10x^2y^3} - \frac{5x}{10x^2y^3}$$

$$\boxed{\frac{12y^2-5x}{10x^2y^3}}$$

$$11) \frac{x-20}{x^2-4x} + \frac{x}{x-4}$$

$$\frac{x-20}{x(x-4)} + \frac{x \cdot x}{x-4 \cdot x}$$

$$\frac{x-20}{x(x-4)} + \frac{x^2}{x(x-4)}$$

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

$$= \boxed{\frac{x+5}{x}}$$

$$9) \frac{7}{x-3} + \frac{4}{x^2-9}$$

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

$$\boxed{\frac{7x+25}{(x+3)(x-3)}}$$

$$12) \frac{x+2}{x^2+4x+4} + \frac{2}{x+2}$$

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

$$\frac{1}{x+2} + \frac{2}{x+2}$$

$$\boxed{\frac{3}{x+2}}$$

$$13) \frac{5}{x+5} - \frac{2x+5}{x^2+9x+20}$$

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

$$\frac{5x+20}{(x+4)(x+5)} - \frac{(2x+5)}{(x+4)(x+5)} = \frac{3x+15}{(x+4)(x+5)} = \frac{3(x+5)}{(x+4)(x+5)}$$

$$= \boxed{\frac{3}{x+4}}$$