Integrated Math 3
Unit 7: Modeling Rational Representations
7.4

Name: ______________________

Date: __________ Period: ______

Objective: To add and subtract rational expressions with like and unlike denominators.

Warm Up: Find the sum or difference of the following fractions.

a) $\frac{1}{5}+\frac{2}{5}=\boxed{\frac{3}{5}}$

b) $\frac{1}{3}\cdot\frac{4}{4}+\frac{2}{4}\cdot\frac{3}{3}=$ $\frac{4}{12}+\frac{6}{12}=\frac{10}{12}=\boxed{\frac{5}{6}}$

c) $\frac{15}{16}-\frac{3}{4}\cdot\frac{4}{4}=$ $\frac{15}{16}-\frac{12}{16}=\boxed{\frac{3}{16}}$

d) $\frac{18}{19}\cdot\frac{7}{7}-\frac{2}{7}\cdot\frac{19}{19}=$ $\frac{126}{133}-\frac{38}{133}=\boxed{\frac{88}{133}}$

Fraction Rules:

$$\frac{a}{b}+\frac{c}{b}=\frac{a+c}{b} \text{ OR } \frac{a}{b}-\frac{c}{b}=\frac{a-c}{b}$$

If the denominators are not the same, then you need to multiply the **individual pieces** by an expression to get the same denominator.

Example 1: Simplify the expression by adding or subtracting rational expressions with like denominators.

a. $\frac{7}{4x}+\frac{3}{4x}=\frac{\cancel{10}\,5}{\cancel{4}_{2}x}=\boxed{\frac{5}{2x}}$

b. $\frac{2}{x+3}-\frac{4}{x+3}=\boxed{\frac{-2}{x+3}}$

c. $\frac{2x}{x+6}-\frac{5}{x+6}=\boxed{\frac{2x-5}{x+6}}$

Example 2: Simplify the expression by adding or subtracting rational expressions with unlike denominators.

a. $\frac{3 \cdot 3}{3 \cdot 4x^2} + \frac{2x \cdot x}{12x \cdot x}$

$= \frac{9}{12x^2} + \frac{2x^2}{12x^2}$

$= \boxed{\frac{2x^2+9}{12x^2}}$

b. $\frac{5}{6x^2} + \frac{x}{4x^2-12x} = \frac{2(x-3) \cdot 5}{2(x-3) \cdot 6x^2} + \frac{x \cdot 3x}{4x(x-3) \cdot 3x}$

$= \frac{10(x-3)}{12x^2(x-3)} + \frac{3x^2}{12x^2(x-3)}$

$= \frac{3x^2 + 10(x-3)}{12x^2(x-3)}$

$= \boxed{\frac{3x^2+10x-30}{12x^2(x-3)}}$

d. $\frac{4}{x^3} + \frac{x}{6x^3+3x^2} = \frac{3(2x+1) \cdot 4}{3(2x+1) \cdot x^3} + \frac{x \cdot x}{3x^2(2x+1) \cdot x}$

$= \frac{12(2x+1)}{3x^3(2x+1)} + \frac{x^2}{3x^3(2x+1)}$

$= \frac{x^2 + 12(2x+1)}{3x^3(2x+1)}$

$= \boxed{\frac{x^2+24x+12}{3x^3(2x+1)}}$

c. $\frac{2x \cdot 4}{2x \cdot x^2} - \frac{8x-1}{2x^3}$

$= \frac{8x}{2x^3} - \frac{8x-1}{2x^3}$

$= \frac{8x-(8x-1)}{2x^3}$

$= \frac{\cancel{8x}-\cancel{8x}+1}{2x^3}$

$= \boxed{\frac{1}{2x^3}}$

e. $\frac{x+1}{x^2+4x+4}-\frac{2}{x^2-4} = \frac{(x-2)}{(x-2)}\cdot\frac{x+1}{(x+2)(x+2)} - \frac{2}{(x+2)(x-2)}\cdot\frac{(x+2)}{(x+2)}$

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

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

	x	1
x	x^2	x
-2	$-2x$	-2

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

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

f. $\frac{x+1}{x^2+6x+9}-\frac{1}{x^2-9} = \frac{(x-3)\cdot}{(x-3)\cdot}\frac{x+1}{(x+3)(x+3)} - \frac{1}{(x+3)(x-3)}\cdot\frac{(x+3)}{(x+3)}$

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

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

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

	x	1
x	x^2	x
-3	$-3x$	-3

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

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