Intro to College Math: Chapter 7.3
Add/ Subtract Rational Expressions

1. Add. Simplify if possible. $\frac{7}{a+7} + \frac{9}{a+7}$

$$\frac{7}{a+7} + \frac{9}{a+7} = \boxed{\frac{16}{a+7}}$$

* Since the denominator is the same, we just add the numerators.

2. Find the following sum or difference. $\frac{a^2-6a}{a-3} + \frac{9}{a-3}$

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

* Since the denominator is the same, we just add the numerators.

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

9: $1 \cdot 9$, $3 \cdot 3$ $\quad (a-3)(a-3)$

* Now factor the numerator
  - Write down the last number + list pairs of numbers that multiply together to get number.
  - Choose pair that add or subtract to get middle number.

$$\frac{(a-3)(a-3)}{a-3}$$

* Now cancel out what is the same on the top + bottom.

$$\boxed{a-3}$$

* Write down what's left.

3. Find the following sum or difference. $\frac{a^2}{a-1} - \frac{2a-1}{a-1}$

$$\frac{a^2}{a-1} - \frac{2a-1}{a-1}$$

* Since the denominator is the same, we subtract the numerators.

$$\frac{a^2-(2a-1)}{a-1}$$

* Since there is a minus sign is between them, we distribute the negative to each term following it

$$\frac{a^2-2a+1}{a-1} \rightarrow (a-1)(a-1)$$

$1 \cdot 1$

* Now factor the numerator
  - Write down the last number + list pairs of numbers that multiply together to get number.
  - Choose pair that add or subtract to get middle number.

$$\frac{(a-1)(a-1)}{a-1}$$

* Now cancel out what is the same on the top + bottom.

$$\boxed{a-1}$$

* Write down what's left.

4. Find the following sum or difference. $\frac{y+5}{y+6} - \frac{y-1}{y+6}$

$\frac{y+5}{y+6} - \frac{y-1}{y+6}$

* Since the denominator is the same, we subtract the numerators.

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

* Since there is a minus sign is between them, we distribute the negative to each term following it

$\frac{y+5-y+1}{y+6}$

* Combine like terms on the top

$\frac{+5+1}{y+6}$

$\boxed{\frac{6}{y+6}}$

5. Find the following sum or difference. $\frac{x}{x+3} + \frac{3}{4}$

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

common denominator $4(x+3)$

* first we must find a common denominator.
  - write down the 2 denominators multiplied by each other.

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

Then rewrite the problem with the common denominator under each fraction. The numerator will be the original numerator multiplied by the part of the common denominator that was not in its original denominator.

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

Now since the denominators are the same, combine into one fraction. Then use the distributive property to get rid of the ( ).

$\frac{4x+3x+9}{4(x+3)} =$

Now combine like terms on the top.

$\frac{7x+9}{4(x+3)}$

6. Subtract and simplify. $\frac{7}{c-1} - \frac{3}{c-4}$

$\frac{7}{c-1} - \frac{3}{c-4}$

common denominator

$(c-1)(c-4)$

* first we must find a common denominator.
  - write down the 2 denominators multiplied by each other.

$\frac{7(c-4)}{(c-1)(c-4)} - \frac{3(c-1)}{(c-1)(c-4)}$

Then rewrite the problem with the common denominator under each fraction. The numerator will be the original numerator multiplied by the part of the common denominator that was not in its original denominator.

$\frac{7(c-4) - 3(c-1)}{(c-1)(c-4)}$

Now since the denominators are the same, combine into one fraction. Then use the distributive property to get rid of the ( ).

$\frac{7c-28-3c+3}{(c-1)(c-4)}$

Now combine like terms on the top.

$\frac{4c-25}{(c-1)(c-4)}$

7. Add and simplify. $\frac{8}{c+1} + \frac{5}{c+8}$

* first we must find a common denominator.
  - write down the 2 denominators multiplied by each other.

$\frac{8}{c+1} + \frac{5}{c+8}$ common denominator $(c+1)(c+8)$

Then rewrite the problem with the common denominator under each fraction. The numerator will be the original numerator multiplied by the part of the common denominator that was not in its original denominator.

$$\frac{8(c+8)}{(c+1)(c+8)} + \frac{5(c+1)}{(c+1)(c+8)}$$

Now since the denominators are the same, combine into one fraction. Then use the distributive property to get rid of the ( ).

$$\frac{8(c+8) + 5(c+1)}{(c+1)(c+8)}$$

Now combine like terms on the top.

$$\frac{8c+64+5c+5}{(c+1)(c+8)}$$

$$\boxed{\frac{13c+69}{(c+1)(c+8)}}$$

8. Find the following sum or difference. $\frac{2x+1}{3x-12} - \frac{x-2}{x-4}$

$\frac{2x+1}{3x-12} - \frac{x-2}{x-4}$

* first factor the denominator that can be factored.

$3(x-4)$

* Then make a common denominator. Since they both have an $x-4$, we only write it down once.

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

common denominator $3(x-4)$

Then rewrite the problem with the common denominator under each fraction. The numerator will be the original numerator multiplied by the part of the common denominator that was not in its original denominator.

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

Now since the denominators are the same, combine into one fraction. Then use the distributive property to get rid of the ( ).

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

Now combine like terms on the top.

$\frac{2x+1-3x+6}{3(x-4)}$

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