Operations on Rational Expressions:

Addition and Subtraction:

When we add fractions such as:

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

we need to find the Least Common Denominator (LCD) to have a common denominator before we can add the fraction2. Since, 6 is the LCD we need to multiply the numerators and the denominator by the appropriate factor to make the denominator in common. This is done as follows:

$$\frac{3(1)}{3(2)} + \frac{2(2)}{2(3)} = \frac{3}{6} + \frac{4}{6} = \frac{3+4}{6} = \frac{7}{6}$$

Similarly, this is the concept for solving rational expressions.

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

The LCD of the denominator is $(x+3)(x-1)$ so we have to multiply each term by the appropriate factor as shown is the following steps. However, we have to always multiply both the numerator and the denominator by the same factor in order to keep the rational terms expression equal The last step is to multiply by distribution and placing the terms in the numerator over the LCD and combing like terms.

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

You try the next one. Subtraction works the same as addition. Just make sure you pay attention to the minus sign.

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

Let's try one that is a bit different.

3) $\frac{8}{xy} - \frac{9}{x^2} + \frac{10}{x^2y}$

To find the LCD of the denominators, we have to find each term to the highest power. Here we have x^2 and y as the terms with the highest powers. Then we multiply each term by the appropriate factor.

$$\frac{8}{xy} - \frac{9}{x^2} + \frac{10}{x^2y} = \frac{(x)\,8}{(x)xy} - \frac{(y)9}{(y)x^2} + \frac{10}{x^2y} = \frac{8x}{x^2y} - \frac{9y}{x^2y} + \frac{10}{x^2y} = \frac{8x - 9y + 10}{x^2y}$$

Simply the Addition and Subtraction problems on Rational Expressions on your own.

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

5) $\frac{3}{X-7} - \frac{2}{x-3}$

6) $\frac{4}{x^3} + \frac{3}{x^2y^3} - \frac{1}{xy}$

7) $\frac{9}{3a^2b} + \frac{3}{3ab^3}$

8) $\frac{6}{5a} + \frac{4}{7a^2}$

9) $\frac{3}{5x^2} - \frac{2}{25x^3}$

10) Write two rational expressions with different denominators and find the LCD. Use the operation of subtraction to simply the two expressions.