

Simplify and state any excluded values:



$$\frac{\cancel{(x+5)}(x+1)}{\cancel{(x^2+6x+5)}} \cdot \frac{\cancel{(x-1)}(x+1)}{\cancel{x^2-1}}$$

$$\frac{(x+1)}{\cancel{(x-1)} \cdot \cancel{(x^2+7x+10)}} \cdot \cancel{(x+5)}(x+2)$$

$$x \neq 1, -5, -2$$

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

Simplify and state any excluded values:

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

$$\frac{\cancel{x-2}}{x+3} \cdot \frac{(\cancel{x+3})(x+1)}{\cancel{x-2}(x^2+4x+3)} = x+1$$

$$x \neq 2, -3, -1$$

# Adding and Subtracting Rational Expressions:

in order to add or subtract fractions, you must have the same denominators. Then you add or subtract the numerators and keep the same denominator. The final step is to then reduce or simplify the fraction, if possible.

$$\text{EX 1: } \frac{5}{9} + \frac{1}{9} = \frac{6}{9} = \frac{2}{3}$$

$$\text{EX 2: } \frac{2a}{11} - \frac{7a}{11} = \frac{-5a}{11}$$

$$\text{EX 3: } \frac{2x+1}{x+2} + \frac{3}{x+2} = \frac{2x+4}{x+2}$$

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

$$x \neq -2$$

$$\boxed{2}$$

$$\text{EX 4: } \frac{4a+5}{a+3} - \frac{a-2}{a+3} =$$

$$\frac{3a+7}{a+3}$$

$$a \neq -3$$

$$\text{EX 5: } \frac{3m^2}{m^2-5m-14} + \frac{(-2m^2+4)}{m^2-5m-14}$$

$$= \frac{m^2 - 4}{m^2 - 5m - 14}$$

$$= \frac{(m-2) \cdot \cancel{(m+2)}}{\cancel{(m+2)} \cdot (m-7)}$$

$$m \neq 7 \text{ or } -2 \quad \frac{m-2}{m-7}$$

$$\text{EX 6: } \frac{2p+3}{3p} + \frac{p+6}{3p}$$

$$\frac{(3p+9)}{3p} = \frac{\cancel{3} \cdot (p+3)}{\cancel{3} \cdot p}$$

$$\frac{p+3}{p}$$

$$p \neq 0$$

$$\text{EX 7: } \frac{9a}{5a+2} - \frac{4a-2}{5a+2}$$

$$\text{EX 8: } \frac{y^2-8y-2}{y^2+2y-24} + \frac{2y+10}{y^2+2y-24}$$

If the fractions don't have the same denominator, then you must find a common denominator and then add or subtract as we just did.

$$\text{EX 9: } \frac{2 \cdot 4}{5 \cdot 4} - \left( \frac{3}{20} \right) \quad \text{L.C.M.} = 20$$

$$\frac{8}{20} - \frac{3}{20}$$

$$= \frac{5}{20}$$

$$= \frac{1}{4}$$

$$\text{EX 10: } \frac{7 \cdot (3x-1)}{7 \cdot 3} + \frac{(2x+5) \cdot 3}{7 \cdot 3} \quad \text{L.C.M.} = 21$$

$$\frac{21x-7}{21} + \frac{6x+15}{21}$$

$$= \frac{27x+8}{21}$$

If the common denominator is not obvious at first, we must find the least common denominator (LCD). To find our LCD, you must first write the denominator in factored form. Then you want to look for the least common denominator where all factors are accounted for.

**EX 11:**  $\frac{3x-5}{x^2-9} - \frac{6}{x+3}$

~~x ± 3 or -3~~

L.C.M.  
 $(x+3)(x-3)$

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

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

$$\frac{3x-5 - 6x+18}{(x-3)(x+3)} = \frac{-3x+13}{(x-3)(x+3)}$$

**EX 12:**  $\frac{5}{p-4} - \frac{5}{5p-20}$

$p \neq 4$  \*

$$\frac{(5)5}{(p-4)5} - \frac{5}{5(p-4)}$$

$$\frac{25-5}{5(p-4)}$$

$$\frac{4}{5(p-4)}$$

$$\frac{4}{p-4}$$



$$\text{Ex 13: } \frac{2}{3a} - \frac{2}{a+2} \quad \frac{\text{L.C.M.}}{(3a)(a+2)}$$

$$\frac{\overset{2a+4}{\cancel{2}}(a+2)}{3a(a+2)} - \frac{\overset{6a}{\cancel{2}}(3a)}{3a(a+2)}$$

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

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

$$\text{Ex 14: } \frac{4y-5}{y^2-7y+12} - \frac{y+7}{y^2+2y-15}$$

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

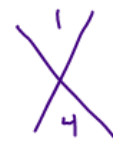
$$\frac{(4y-5)(y+5)}{(y-3)(y-4)(y+5)} - \frac{(y+7)(y-4)}{(y-3)(y-4)(y+5)}$$

$$\begin{array}{l} 20y \\ -5y \\ \hline \end{array} \frac{(4y-5)(y+5) - (y+7)(y-4)}{(y-3)(y-4)(y+5)}$$

$$\frac{4y^2 + 15y - 25 + -y^2 + 3y + 28}{(y-3)(y-4)(y+5)}$$

$$\frac{3y^2 + 12y + 3}{(y-3)(y-4)(y+5)}$$

$$= \frac{3(y^2 + 4y + 1)}{(y-3)(y-4)(y+5)}$$



$$\text{Ex 15: } \frac{a}{(a+3)} - \frac{a-4}{(a)}$$

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

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

$$= \frac{a+12}{a(a+3)}$$

# Classwork:

Adding and Subtracting  
Rational Expressions Practice