

**BEDMAS Rules!**

Steps for multiplying/dividing:

1. Factor the numerator and denominator separately.
2. Identify restrictions (where is denominator = 0 ?).
3. Divide out common factors to simplify.

Steps for adding/subtracting:

1. Factor the denominator.
2. Identify restrictions (where is denominator = 0 ?).
3. Find the lowest common denominator, LCD
4. Express each rational expression with the same LCD
5. Add/subtract the terms in the numerator, keep the LCD as your denominator.
6. Factor the numerator, if possible, and simplify.

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All (four) Operations with Rational Expressions

Ex.1 Simplify and state any restrictions

March 26/2019

$$\begin{aligned}
 \text{(a)} \quad & \frac{x}{x^2-4} - \frac{x-2}{x^2+2x} + \frac{x+2}{x^2-2x} && \text{LCD} \\
 & && = x(x-2)(x+2) \\
 & = \frac{x}{(x-2)(x+2)} - \frac{x-2}{x(x+2)} + \frac{x+2}{x(x-2)} \\
 & = \frac{x(x) - (x-2)(x-2) + (x+2)(x+2)}{x(x-2)(x+2)} \\
 & = \frac{x^2 - (x^2 - 4x + 4) + (x^2 + 4x + 4)}{x(x-2)(x+2)} \\
 & = \frac{x^2 + 8x}{x(x-2)(x+2)} \\
 & = \frac{\cancel{x}(x+8)}{\cancel{x}(x-2)(x+2)} \\
 & = \frac{x+8}{(x-2)(x+2)}, x \neq 0, x \neq \pm 2
 \end{aligned}$$

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$$\begin{aligned}
 & \text{b) } \frac{2}{x} - \frac{x-2}{x+1} \div \frac{x-3}{x+1} \\
 & = \frac{2}{x} - \underbrace{\left( \frac{x-2}{x+1} \right) \left( \frac{x+1}{x-3} \right)}_{t_2} \\
 & = \frac{2}{x} - \frac{(x-2)\cancel{(x+1)}}{\cancel{(x+1)}(x-3)} \\
 & = \frac{2}{x} - \frac{x-2}{x-3} \\
 & = \frac{2(x-3) - (x-2)(x)}{x(x-3)} \\
 & = \frac{(2x-6) - (x^2-2x)}{x(x-3)} \\
 & = \frac{-x^2 + 4x - 6}{x(x-3)} \checkmark, x \neq -1, 0, 3
 \end{aligned}$$

A term is separated by addition or subtraction.

LCD required between terms.

LCD:  $x(x-3)$

$-[x^2 - 4x + 6]$

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Homework:

p.68 # 10aceg, 14adf

Additional questions:

$$1) \frac{3x}{x^2 + 3x + 2} - \frac{4x}{x^2 + 5x + 6} + \frac{5x}{x^2 + 4x + 3}$$

$$2) \frac{x-2}{6x^2 - 7x - 5} \div \frac{2x}{3x^2 - 5x} - \frac{3x+2}{2x^2 + 11x + 5}$$

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