Order of Operations (BEDMAS)
1.Brackets
2.Exponents
3.Division/Multiplication (in order, left to right)
4.Addition/Subtraction (in order, left to right)

$a \times b \div c$
① ②

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

(a) $\dfrac{x}{x^2-4} - \dfrac{x-2}{x^2+2x} + \dfrac{x+2}{x^2-2x}$

LCD $= x(x-2)(x+2)$

$= \dfrac{x}{(x-2)(x+2)} - \dfrac{x-2}{x(x+2)} + \dfrac{x+2}{x(x-2)}$

$= \dfrac{x(x) - (x-2)(x-2) + (x+2)(x+2)}{x(x-2)(x+2)}$

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

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

$= \dfrac{x^2 + 8x}{x(x-2)(x+2)}$

$= \dfrac{x(x+8)}{x(x-2)(x+2)}$, $x \neq 0, \pm 2$

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b) $\frac{2}{x}_{R} - \left(\frac{x-2}{x+1}_{R} \div \frac{x-3}{x+1}_{R}\right)$

$x \neq 0, -1, 3$ ✓ ✓

$= \frac{2}{x} - \left(\frac{x-2}{x+1} \cdot \frac{x+1}{x-3}_{R}\right)$

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

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

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

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

$= \frac{-x^2+4x-6}{x(x-3)}, \; x \neq 0, 3, -1$

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

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Homework:

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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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