Math 45 SSM 2/e 7.3 Adding and Subtracting Rational Expressions (Day 1)

Day 1 1) Add or and subtract when common denominator is given.
Day 2 2) Add or subtract when factor out −1 needed to create common denominator.

{Full-on unlike denominators are in Math 60}

Perform the indicated operations and simplify completely.

① $\frac{7}{8} - \frac{5}{8}$

$= \frac{7-5}{8}$

$= \frac{2}{8}$

$= \frac{\cancel{2}}{\cancel{2}\cdot 2\cdot 2}$

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

step1: We already have a common denominator.
step2: subtract numerators.
Keep common denominator unchanged
step3: reduce by dividing out common factors

We will use these same steps when subtracting rational expressions, and similar steps for adding.

② $\frac{x^2}{x+7} + \frac{7x}{x+7}$

step1: Notice common denominator

$= \frac{x^2+7x}{x+7}$

step2: Add numerators, keep denominator.

$= \frac{x(x+\cancel{7})}{(\cancel{x+7})}$

step3:
Factor completely
Divide out common factors.

$= \boxed{x}$

③ $\frac{2x^2+x}{x^2-4} + \frac{x-x^2}{x^2-4}$

step1: notice common denominator

$= \frac{2x^2+x+x-x^2}{x^2-4}$

step2: add numerators, keep denominator

$= \frac{x^2+2x}{x^2-4}$

combine like terms in numerator.

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

step3: Factor completely + divide out common factors. (Simplify.)

$= \boxed{\frac{x}{x-2}}$

(4) $\frac{2n^2}{n^2-1} - \frac{2n}{n^2-1}$

step 1: Notice common denominator

$= \frac{2n^2-2n}{n^2-1}$

step 2: Subtract numerators, keep denom.

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

step 3: Simplify by factor + cancel.

$= \boxed{\frac{2n}{n+1}}$

(5) $\frac{9x+1}{x+1} - \frac{6x-2}{x+1}$

step 1: CD, step 2: subtract numerators.

$= \frac{9x+1-(6x-2)}{x+1}$

IMPORTANT
To subtract $6x-2$, must subtract both terms.
Must distribute negative!

$= \frac{9x+1-6x+2}{x+1}$

$= \frac{3x+3}{x+1}$

step 3 simplify

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

$= \boxed{3}$

(6) $\frac{2x^2-5x}{3x} - \frac{x^2-13x}{3x}$

step 1 CD.

$= \frac{2x^2-5x-(x^2-13x)}{3x}$

$= \frac{2x^2-5x-x^2+13x}{3x}$

step 2: subtract by dist negative.

$= \frac{x^2+8x}{3x}$

Combine like terms

$= \frac{x(x+8)}{3\cdot x} = \boxed{\frac{x+8}{3}}$

step 3 Divide out $\frac{x}{x}=1$.

7.3.23 **Add the rational expressions and simplify the result, if possible.**

$$\frac{2x-3}{x-1}+\frac{10x-1}{x-1}$$

$$\frac{2x-3}{x-1}+\frac{10x-1}{x-1}=\frac{4(3x-1)}{x-1}$$

(Simplify your answer. Type your answer in factored form.)

YOU ANSWERED: $\frac{2(6x)-4}{x-1}$

same denom ✓ add numerators:

$$\frac{2x-3+10x-1}{x-1}$$

combine like terms

$$\frac{12x-2}{x-1}$$

factor

$$\boxed{\frac{2(6x-1)}{x-1}}$$

(nothing cancels

7.3.85 **Find a rational expression which, when added to $\frac{-3x+8}{x+4}$, gives a sum of one.**

The answer is ☐. (Simplify your answer.)

Remember that $1 = \frac{x+4}{x+4}$ using our denominator.

Find

$$\left(\frac{\quad}{x+4}\right) + \left(\frac{-3x+8}{x+4}\right) = 1$$

means

$$\left(\frac{\quad}{x+4}\right) + \left(\frac{-3x+8}{x+4}\right) = \frac{x+4}{x+4}$$

which means only the numerators matter

$$(\quad) + (-3x+8) = x+4$$

Isolate this; $+3x$ both sides; -8 both sides

$$(\quad) = x+3x+4-8$$

$$(\quad) = 4x-4$$

So the rational expression we seek is

$$\boxed{\frac{4x-4}{x+4}}$$

check

$$\frac{4x-4}{x+4} + \frac{-3x+8}{x+4}$$

$$= \frac{4x-4-3x+8}{x+4}$$

$$= \frac{x+4}{x+4} = 1 \checkmark$$ ☺