Simplify the following expressions, producing a rational expression (or a polynomial) in either expanded or factored form (your choice). Show at least two *intermediate steps for each.*

1 $\dfrac{5}{x-4} + \dfrac{3}{x+2}$

$$\frac{5}{x-4} + \frac{3}{x+2} = \frac{5(x+2)}{(x-4)(x+2)} + \frac{3(x-4)}{(x-4)(x+2)} = \frac{5x+10}{(x-4)(x+2)} + \frac{3x-12}{(x-4)(x+2)}$$

$$= \frac{(5x+10)+(3x-12)}{(x-4)(x+2)} = \frac{8x-2}{(x-4)(x+2)} = \frac{2(4x-1)}{(x-4)(x+2)}.$$

You could also leave the answer in expanded form as $\frac{8x-2}{x^2-2x-8}$.

2 $\dfrac{1}{x^2+5x} + \dfrac{1}{x^2-5x}$

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

$$= \frac{(x-5)+(x+5)}{x(x-5)(x+5)} = \frac{2x}{x(x-5)(x+5)} = \frac{2}{(x-5)(x+5)}.$$

You could also leave the answer in expanded form as $\frac{2}{x^2-25}$.

3 $\dfrac{5}{x} - \dfrac{3}{x-4}$

$$\frac{5}{x} - \frac{3}{x-4} = \frac{5(x-4)}{x(x-4)} + \frac{-3x}{x(x-4)} = \frac{5x-20}{x(x-4)} + \frac{-3x}{x(x-4)} = \frac{(5x-20)+(-3x)}{x(x-4)} = \frac{2x-20}{x(x-4)} = \frac{2(x-10)}{x(x-4)}.$$

You could also leave the answer in expanded form as $\frac{2x-20}{x^2-4x}$.