

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

1 $\frac{p^2 - 9}{5} \cdot \frac{25p}{2p - 6}$

$$\frac{p^2 - 9}{5} \cdot \frac{25p}{2p - 6} = \frac{(p - 3)(p + 3)}{5} \cdot \frac{5^2 p}{2(p - 3)} = \frac{5^2 (p - 3)(p + 3)}{2 \cdot 5(p - 3)} = \frac{5(p + 3)}{2}.$$

You could also leave the answer in expanded form as $\frac{5p+15}{2}$; since it's a polynomial, you could also leave it in factored form as $\frac{5}{2}(p + 3)$ or in expanded form as $\frac{5}{2}p + \frac{15}{2}$.

2 $\frac{x^2 - 9}{x^2 - 16} \div \frac{x^2 - x - 12}{x^2 + x - 12}$

$$\begin{aligned} \frac{x^2 - 9}{x^2 - 16} \div \frac{x^2 - x - 12}{x^2 + x - 12} &= \frac{x^2 - 9}{x^2 - 16} \cdot \frac{x^2 + x - 12}{x^2 - x - 12} = \frac{(x - 3)(x + 3)}{(x - 4)(x + 4)} \cdot \frac{(x - 3)(x + 4)}{(x - 4)(x + 3)} \\ &= \frac{(x - 3)^2 (x + 3)(x + 4)}{(x - 4)^2 (x + 3)(x + 4)} = \frac{(x - 3)^2}{(x - 4)^2}. \end{aligned}$$

You could also leave the answer in expanded form as $\frac{x^2 - 6x + 9}{x^2 - 8x + 16}$.