

Simplify

$$\begin{aligned} \textcircled{1} \quad & 5(2x^2 - 6x) - (4x^2 - 3x) \\ &= 10x^2 - 30x - 4x^2 + 3x \\ &= \boxed{6x^2 - 27x} \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad & 7 + 2[3(x+1) - 2(3x-1)] \\ &= 7 + 2[3x + 3 - 6x + 2] \\ &= 7 + 6x + 6 - 12x + 4 \\ &= \boxed{-6x + 17} \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad & \{1, 2, 5\} \cap \{5, a\} \\ &= \boxed{\{5\}} \end{aligned}$$

$$\begin{aligned} \textcircled{4} \quad & \{1, 2, 5\} \cup \{5, a\} \\ &= \boxed{\{1, 2, 5, a\}} \end{aligned}$$

$$\begin{aligned}
 \textcircled{5} \quad & (2x^2y^3 - xy + y^2) - (-4x^2y^3 - 5xy - y^2) \\
 & = 2x^2y^3 - xy + y^2 + 4x^2y^3 + 5xy + y^2 \\
 & = \boxed{6x^2y^3 + 4xy + 2y^2}
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{6} \quad & \frac{30x^3y^4z^{-9}}{6x^9y^{-4}z^{-6}} = \frac{30}{6} x^{3-9} y^{4-(-4)} z^{-9-(-6)} \\
 & = \boxed{5x^{-6}y^8z^{-3}}
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{7} \quad & \sqrt{6r} \sqrt{3r} = \sqrt{18r^2} = \sqrt{9} \sqrt{2} \sqrt{r^2} \\
 & = \boxed{3\sqrt{2}r}
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{8} \quad & 4\sqrt{50} - 3\sqrt{18} = 4\sqrt{25\sqrt{2}} - 3\sqrt{9\sqrt{2}} \\
 & = 4 \cdot 5\sqrt{2} - 3 \cdot 3\sqrt{2} \\
 & = 20\sqrt{2} - 9\sqrt{2} = \boxed{11\sqrt{2}}
 \end{aligned}$$

$$\begin{aligned} \textcircled{9} \quad \frac{3}{5+\sqrt{2}} &= \frac{3}{5+\sqrt{2}} \cdot \frac{5-\sqrt{2}}{5-\sqrt{2}} \\ &= \frac{15-3\sqrt{2}}{25-2} \\ &= \boxed{\frac{15-3\sqrt{2}}{23}} \end{aligned}$$

$$\begin{aligned} \textcircled{10} \quad \sqrt[3]{16x^4} &= \sqrt[3]{16} \cdot \sqrt[3]{x^4} \\ &= \sqrt[3]{2^4} \cdot \sqrt[3]{x^4} \\ &= \boxed{2^{4/3} x^{4/3}} \end{aligned}$$

$$\textcircled{11} \quad \frac{x^2+2x-3}{x^2-3x+2} = \frac{(x+3)\cancel{(x-1)}}{(x+2)\cancel{(x-1)}} = \boxed{\frac{x+3}{x-2}}$$

$\textcircled{12}$ Scientific Notation

$$\begin{aligned} \frac{5 \times 10^{-6}}{20 \times 10^{-8}} &= \frac{5}{20} \times 10^{-6-(-8)} = .25 \times 10^2 \\ &= \boxed{2.5 \times 10} \end{aligned}$$

$$\begin{aligned} \textcircled{13} \quad (2x-5)(x^2-4x+3) &= 2x^3-8x^2+6x-5x^2+20x-15 \\ &= \boxed{2x^3-13x^2+26x-15} \end{aligned}$$

14)

$$(5x+3y)^2 = (5x+3y)(5x+3y)$$
$$= \boxed{25x^2 + 30xy + 9y^2}$$

15)

$$\frac{2x+8}{x-3} \cdot \frac{x^2+5x+4}{x^2-9} = \frac{2x+8}{x-3} \cdot \frac{x^2-9}{x^2+5x+4}$$
$$= \frac{2(x+4)}{x-3} \cdot \frac{(x-3)(x+3)}{(x+4)(x+1)}$$

16)

$$\frac{x}{x+3} + \frac{5}{x-3} = \frac{2(x+3)}{x+1} = \boxed{\frac{2x+6}{x+1}}$$

$$= \frac{(x)(x-3)}{(x+3)(x-3)} + \frac{5(x+3)}{(x-3)(x+3)} = \frac{x^2-3x+5x+15}{(x-3)(x+3)} = \boxed{\frac{x^2+2x+15}{x^2-9}}$$

17)

$$\frac{2x+3}{x^2-7x+12} - \frac{2}{x-3} = \frac{2x+3}{(x-4)(x-3)} - \frac{2}{(x-3)} \left(\frac{x-4}{x-4} \right)$$

$$= \frac{2x+3 - 2x+8}{(x-4)(x-3)}$$

$$= \boxed{\frac{11}{x^2-7x+12}}$$