

Problem 1 Simplify the following expressions

[/ 6 marks]

$$\text{i) } \frac{1}{2} + \frac{2}{3} + \frac{3}{4} = \frac{6+8+9}{12} = \boxed{\frac{23}{12}}$$

$$\text{ii) } \sqrt{\left(\frac{1}{4} \quad \frac{1}{9}\right)\left(\frac{1}{5} \quad \frac{4}{25}\right)} = \sqrt{\left(\frac{9}{36} \quad \frac{4}{25}\right)\left(\frac{5}{25} \quad \frac{4}{25}\right)} = \sqrt{\frac{5}{36} \times \frac{1}{25}} = \boxed{\frac{\sqrt{5}}{30}}$$

Problem 2 Simplify

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$$1) \sqrt{72} = \boxed{6\sqrt{2}}$$

$$3) \frac{\sqrt{30} \times \sqrt{20}}{5\sqrt{6}} = \frac{\sqrt{6} \sqrt{100}}{5\sqrt{6}} = \boxed{2}$$

$$2) \frac{\sqrt{72}}{\sqrt{8}} = \frac{6\sqrt{2}}{2\sqrt{2}} = \boxed{3}$$

$$4) \frac{(3 + \sqrt{8})^2 + (3 - \sqrt{8})^2}{2} = \frac{2 \times 9 + 2 \times 8}{2} = \boxed{17}$$

Problem 3 Expand and simplify as far as possible

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$$1) \frac{(2x^2)^3}{\sqrt{64x^{10}}} = \frac{2^3(x^2)^3}{\sqrt{64} \sqrt{x^{10}}} = \frac{8x^6}{8x^5} = \boxed{x}$$

$$2) \sqrt{(6x)(2x^3)(3x^2)} = \sqrt{36 \times x^{1+3+2}} = \boxed{6x^3}$$

$$3) \left(\frac{4x}{3y}\right)^2 \left(\frac{27y^3}{18x^2}\right) = \frac{16x^2 \times 27y^3}{9y^2 \times 18x^2} = \frac{2 \times 8 \times 3 \times 9x^2y^3}{3 \times 3 \times 2 \times 9x^2y^2} = \boxed{\frac{8}{3}y}$$

$$4) (x+2y)^2 - (2x-y)^2 = ((x+2y) - (2x-y))((x+2y) + (2x-y)) = (x+3y)(3x+y) = \boxed{3x^2 + 8xy + 3y^2}$$

Problem 4 Factorise

$$1) 12x^2 - 3y^{14} = \boxed{3(2x^2 - y^7)(2x + y^7)}$$

$$3) x^2y^2 - 5xy + 6 = \boxed{(xy-2)(xy-3)}$$

$$2) 12x^2yz^3 - 3y^{15}z^3 = \boxed{3z^3y(2x^2 - y^{12})(2x + y^7)}$$

$$4) x^2y^3 \pm 5xy^2 + 6y = \boxed{y(xy \pm 2)(xy \pm 3)}$$

Problem 5 « completing the square »

$$1) \text{ start with : } x - \frac{3}{2})^2 - \frac{9}{4} - 28 = 0 \Rightarrow x - \frac{3}{2})^2 = \frac{121}{4} \Rightarrow x - \frac{3}{2}) = \pm \sqrt{\frac{121}{4}} \Rightarrow \boxed{x = \frac{3 \pm 11}{2}}$$

$$2) \text{ start with : } (x+5)^2 + 25 - 15 = 0 \quad \text{hence : } \boxed{x = 5 \pm \sqrt{10}}$$