Section 1: Quadratic graphs and equations

Exercise level 2

1. Factorise:
   (i) $ax^2 - 2ax - 3a$ (ii) $2cx^2 + c(6a + b)x + 3abc$

2. Simplify these expressions where possible.
   (i) $\dfrac{x^2 + x - 6}{x^2 - x - 2}$ (ii) $\dfrac{x^2 - 4x + 4}{x^2 + x - 6}$
   (iii) $\dfrac{x^2 + x - 2}{x^2 + 4x + 3}$ (iv) $\dfrac{4x^2 - 1}{4x^2 - 4x - 3}$
   (v) $\dfrac{2x + 3}{3x + 1} \times \left(3x^2 - 2x - 1\right)$ (vi) $\dfrac{x + 2}{2x^2 - x - 1} \div \dfrac{x^2 - x - 6}{2x + 1}$

3. Solve these quadratic equations by factorising.
   (i) $4x^2 - 3x - 10 = 0$ (ii) $6x^2 - 19x + 10 = 0$

4. The length of a rectangle is 3 cm greater than its width. The area of the rectangle is 40 cm². Find the length and width of the rectangle.

5. Solve the following equations.
   (i) $x^4 - 5x^2 + 4 = 0$ (ii) $4x^4 + 11x^2 - 3 = 0$

6. (i) Write $x^2 + 4x + 1$ in the completed square form.
   (ii) Hence write down the equation of the line of symmetry and the coordinates of the vertex of the graph $y = x^2 + 4x + 1$.
   (iii) Sketch the graph.

7. (i) Write $x^2 - 3x + 1$ in the completed square form.
   (ii) Hence write down the equation of the line of symmetry and the coordinates of the vertex of the graph $y = x^2 - 3x + 1$.
   (iii) Sketch the graph.