1 Express each of the following in the form 4^n:

(i) $\frac{1}{16}$, [1]

(ii) 64, [1]

(iii) 8. [2]

2 (i) The curve $y = x^2$ is translated 2 units in the positive x-direction. Find the equation of the curve after it has been translated. [2]

(ii) The curve $y = x^3 - 4$ is reflected in the x-axis. Find the equation of the curve after it has been reflected. [1]

3 Express each of the following in the form $k\sqrt{2}$, where k is an integer:

(i) $\sqrt{200}$, [1]

(ii) $\dfrac{12}{\sqrt{2}}$, [1]

(iii) $5\sqrt{8} - 3\sqrt{2}$. [2]

4 Solve the equation $2x - 7x^{\frac{1}{2}} + 3 = 0$. [5]

5 Find the gradient of the curve $y = 8\sqrt{x} + x$ at the point whose x-coordinate is 9. [5]

6 (i) Expand and simplify $(x - 5)(x + 2)(x + 5)$. [3]

(ii) Sketch the curve $y = (x - 5)(x + 2)(x + 5)$, giving the coordinates of the points where the curve crosses the axes. [3]

7 Solve the inequalities

(i) $8 < 3x - 2 < 11$, [3]

(ii) $y^2 + 2y \geqslant 0$. [4]

8 The curve $y = x^3 - kx^2 + x - 3$ has two stationary points.

(i) Find $\dfrac{dy}{dx}$. [2]

(ii) Given that there is a stationary point when $x = 1$, find the value of k. [3]

(iii) Determine whether this stationary point is a minimum or maximum point. [2]

(iv) Find the x-coordinate of the other stationary point. [3]

9 **(i)** Find the equation of the circle with radius 10 and centre (2, 1), giving your answer in the form $x^2 + y^2 + ax + by + c = 0$. [3]

(ii) The circle passes through the point $(5, k)$ where $k > 0$. Find the value of k in the form $p + \sqrt{q}$. [3]

(iii) Determine, showing all working, whether the point $(-3, 9)$ lies inside or outside the circle. [3]

(iv) Find an equation of the tangent to the circle at the point (8, 9). [5]

10 **(i)** Express $2x^2 - 6x + 11$ in the form $p(x + q)^2 + r$. [4]

(ii) State the coordinates of the vertex of the curve $y = 2x^2 - 6x + 11$. [2]

(iii) Calculate the discriminant of $2x^2 - 6x + 11$. [2]

(iv) State the number of real roots of the equation $2x^2 - 6x + 11 = 0$. [1]

(v) Find the coordinates of the points of intersection of the curve $y = 2x^2 - 6x + 11$ and the line $7x + y = 14$. [5]