Question 1 — Functions and Graphs **(8 marks)**

Consider the quadratic function $f(x) = -2(x - 1)^2 + 8$.

(a) Describe the sequence of transformations applied to the graph of $y = x^2$ to obtain the graph of $y = f(x)$. (2 marks)

(b) Determine the coordinates of the x-intercepts of the graph of $y = f(x)$. (3 marks)

(c) State the range of f. (1 mark)

(d) Let $g(x) = x + 1$. Determine $f(g(x))$ in simplified form. (2 marks)

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Question 2 — Trigonometric Functions **(8 marks)**

Give exact values throughout this question.

(a) Determine the exact value of $\cos(5\pi/6)$. (2 marks)

(b) Solve $2\sin(x) + 1 = 0$ for $0 \leq x \leq 2\pi$, giving exact solutions. (3 marks)

(c) State the amplitude and period of $y = 3\cos(2x)$. (2 marks)

(d) State the range of $y = 3\cos(2x) - 1$. (1 mark)

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Question 3 — Introduction to Differential Calculus **(9 marks)**

Let $f(x) = x^2 + 3x$.

(a) Use first principles to show that $f'(x) = 2x + 3$. (4 marks)

(b) Hence, determine the equation of the tangent to the curve $y = f(x)$ at the point where $x = 1$. (3 marks)

(c) Determine the x-coordinate of the stationary point of the graph of $y = f(x)$. (2 marks)

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