

**ADVANCED SUBSIDIARY GCE
MATHEMATICS**

4721/01

Core Mathematics 1

THURSDAY 15 MAY 2008

Morning

Time: 1 hour 30 minutes

Additional materials: Answer Booklet (8 pages)
List of Formulae (MF1)

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the spaces provided on the answer booklet.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.
- **You are not permitted to use a calculator in this paper.**

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is 72.
- **You are reminded of the need for clear presentation in your answers.**



WARNING

**You are not allowed to use
a calculator in this paper.**

This document consists of 4 printed pages.

- 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) $\frac{12}{\sqrt{2}}$, [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) $y^2 + 2y \geq 0$. [4]
- 8 The curve $y = x^3 - kx^2 + x - 3$ has two stationary points.
- (i) Find $\frac{dy}{dx}$. [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]

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