

**ADVANCED SUBSIDIARY GCE
MATHEMATICS**

4721/01

Core Mathematics 1

WEDNESDAY 9 JANUARY 2008

Afternoon

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 $\frac{4}{3 - \sqrt{7}}$ in the form $a + b\sqrt{7}$, where a and b are integers. [3]
- 2 (i) Write down the equation of the circle with centre $(0, 0)$ and radius 7. [1]
 (ii) A circle with centre $(3, 5)$ has equation $x^2 + y^2 - 6x - 10y - 30 = 0$. Find the radius of the circle. [2]
- 3 Given that $3x^2 + bx + 10 = a(x + 3)^2 + c$ for all values of x , find the values of the constants a , b and c . [4]
- 4 Solve the equations
 (i) $10^p = 0.1$, [1]
 (ii) $(25k^2)^{\frac{1}{2}} = 15$, [3]
 (iii) $t^{-\frac{1}{3}} = \frac{1}{2}$. [2]
- 5 (i) Sketch the curve $y = x^3 + 2$. [2]
 (ii) Sketch the curve $y = 2\sqrt{x}$. [2]
 (iii) Describe a transformation that transforms the curve $y = 2\sqrt{x}$ to the curve $y = 3\sqrt{x}$. [3]
- 6 (i) Solve the equation $x^2 + 8x + 10 = 0$, giving your answers in simplified surd form. [3]
 (ii) Sketch the curve $y = x^2 + 8x + 10$, giving the coordinates of the point where the curve crosses the y -axis. [3]
 (iii) Solve the inequality $x^2 + 8x + 10 \geq 0$. [2]
- 7 (i) Find the gradient of the line l which has equation $x + 2y = 4$. [1]
 (ii) Find the equation of the line parallel to l which passes through the point $(6, 5)$, giving your answer in the form $ax + by + c = 0$, where a , b and c are integers. [3]
 (iii) Solve the simultaneous equations

$$y = x^2 + x + 1 \quad \text{and} \quad x + 2y = 4. \quad [4]$$
- 8 (i) Find the coordinates of the stationary points on the curve $y = x^3 + x^2 - x + 3$. [6]
 (ii) Determine whether each stationary point is a maximum point or a minimum point. [3]
 (iii) For what values of x does $x^3 + x^2 - x + 3$ decrease as x increases? [2]

9 The points A and B have coordinates $(-5, -2)$ and $(3, 1)$ respectively.

(i) Find the equation of the line AB , giving your answer in the form $ax + by + c = 0$. [3]

(ii) Find the coordinates of the mid-point of AB . [2]

The point C has coordinates $(-3, 4)$.

(iii) Calculate the length of AC , giving your answer in simplified surd form. [3]

(iv) Determine whether the line AC is perpendicular to the line BC , showing all your working. [4]

10 Given that $f(x) = 8x^3 + \frac{1}{x^3}$,

(i) find $f''(x)$, [5]

(ii) solve the equation $f(x) = -9$. [5]

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