

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

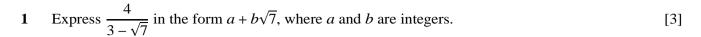
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is 72.
- You are reminded of the need for clear presentation in your answers.



WARNING

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

This document consists of 4 printed pages.



- **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.
- 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 Solve the equations

(i)
$$10^p = 0.1$$
,

(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 $x^2 + 8x + 10 \ge 0$. [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

$$y = x^2 + x + 1$$
 and $x + 2y = 4$. [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]

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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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