

**ADVANCED SUBSIDIARY GCE UNIT  
MATHEMATICS**

**4721/01**

Core Mathematics 1

**THURSDAY 7 JUNE 2007**

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.
- 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.

**ADVICE TO CANDIDATES**

- Read each question carefully and make sure you know what you have to do before starting your answer.
- **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 Simplify  $(2x + 5)^2 - (x - 3)^2$ , giving your answer in the form  $ax^2 + bx + c$ . [3]

2 (a) On separate diagrams, sketch the graphs of

(i)  $y = \frac{1}{x}$ , [2]

(ii)  $y = x^4$ . [1]

(b) Describe a transformation that transforms the curve  $y = x^3$  to the curve  $y = 8x^3$ . [2]

3 Simplify the following, expressing each answer in the form  $a\sqrt{5}$ .

(i)  $3\sqrt{10} \times \sqrt{2}$  [2]

(ii)  $\sqrt{500} + \sqrt{125}$  [3]

4 (i) Find the discriminant of  $kx^2 - 4x + k$  in terms of  $k$ . [2]

(ii) The quadratic equation  $kx^2 - 4x + k = 0$  has equal roots. Find the possible values of  $k$ . [3]

5



The diagram shows a rectangular enclosure, with a wall forming one side. A rope, of length 20 metres, is used to form the remaining three sides. The width of the enclosure is  $x$  metres.

(i) Show that the enclosed area,  $A \text{ m}^2$ , is given by

$$A = 20x - 2x^2. \quad [2]$$

(ii) Use differentiation to find the maximum value of  $A$ . [4]

6 By using the substitution  $y = (x + 2)^2$ , find the real roots of the equation

$$(x + 2)^4 + 5(x + 2)^2 - 6 = 0. \quad [6]$$

7 (a) Given that  $f(x) = x + \frac{3}{x}$ , find  $f'(x)$ . [4]

(b) Find the gradient of the curve  $y = x^{\frac{5}{2}}$  at the point where  $x = 4$ . [5]

- 8** (i) Express  $x^2 + 8x + 15$  in the form  $(x + a)^2 - b$ . [3]
- (ii) Hence state the coordinates of the vertex of the curve  $y = x^2 + 8x + 15$ . [2]
- (iii) Solve the inequality  $x^2 + 8x + 15 > 0$ . [4]
- 9** The circle with equation  $x^2 + y^2 - 6x - k = 0$  has radius 4.
- (i) Find the centre of the circle and the value of  $k$ . [4]
- The points  $A(3, a)$  and  $B(-1, 0)$  lie on the circumference of the circle, with  $a > 0$ .
- (ii) Calculate the length of  $AB$ , giving your answer in simplified surd form. [5]
- (iii) Find an equation for the line  $AB$ . [3]
- 10** (i) Solve the equation  $3x^2 - 14x - 5 = 0$ . [3]
- A curve has equation  $y = 3x^2 - 14x - 5$ .
- (ii) Sketch the curve, indicating the coordinates of all intercepts with the axes. [3]
- (iii) Find the value of  $c$  for which the line  $y = 4x + c$  is a tangent to the curve. [6]

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

OCR is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.