

## ADVANCED SUBSIDIARY GCE UNIT MATHEMATICS

Core Mathematics 1 THURSDAY 7 JUNE 2007

Morning

4721/01

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.



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]



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,  $A m^2$ , is given by

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

- (ii) Use differentiation to find the maximum value of A.
- 6 By using the substitution  $y = (x + 2)^2$ , find the real roots of the equation

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

[4]

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 $a > 0$ .	[7]
	(ii) Calculate the length of $AB$ , giving your answer in simplified surd form.	[5]
	(iii) Find an equation for the line <i>AB</i> .	[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]

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