OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE UNIT **4721/01**

MATHEMATICS

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.

[Turn over

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 $a\sqrt{5}$.

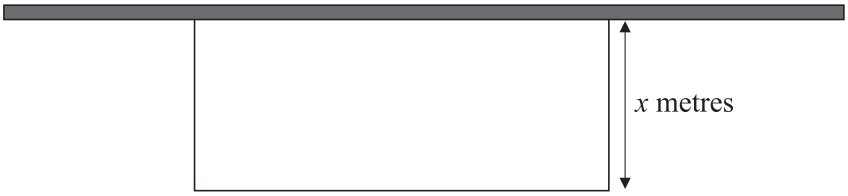
(i) $3\sqrt{10} \times \sqrt{2}$ [2]

(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

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

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

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

