OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE UNIT **4721/01**

MATHEMATICS

Core Mathematics 1

TUESDAY 16 JANUARY 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 Express $\dfrac{5}{2-\sqrt{3}}$ in the form $a + b\sqrt{3}$, where a and b are integers. [3]

2 Evaluate

(i) 6^0, [1]

(ii) $2^{-1} \times 32^{\frac{4}{5}}$. [3]

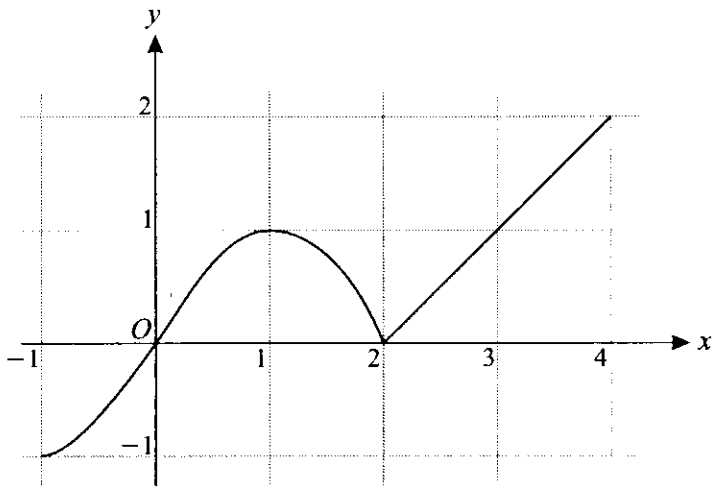
3 Solve the inequalities

(i) $3(x - 5) \leqslant 24$, [2]

(ii) $5x^2 - 2 > 78$. [3]

4 Solve the equation $x^{\frac{2}{3}} + 3x^{\frac{1}{3}} - 10 = 0$. [5]

5



The graph of $y = f(x)$ for $-1 \leqslant x \leqslant 4$ is shown above.

(i) Sketch the graph of $y = -f(x)$ for $-1 \leqslant x \leqslant 4$. [2]

(ii) The point $P(1, 1)$ on $y = f(x)$ is transformed to the point Q on $y = 3f(x)$. State the coordinates of Q. [2]

(iii) Describe the transformation which transforms the graph of $y = f(x)$ to the graph of $y = f(x + 2)$. [2]

6 **(i)** Express $2x^2 - 24x + 80$ in the form $a(x - b)^2 + c$. [4]

(ii) State the equation of the line of symmetry of the curve $y = 2x^2 - 24x + 80$. [1]

(iii) State the equation of the tangent to the curve $y = 2x^2 - 24x + 80$ at its minimum point. [1]

7 Find $\frac{dy}{dx}$ in each of the following cases.

(i) $y = 5x + 3$ [1]

(ii) $y = \frac{2}{x^2}$ [3]

(iii) $y = (2x + 1)(5x - 7)$ [4]

8 **(i)** Find the coordinates of the stationary points of the curve $y = 27 + 9x - 3x^2 - x^3$. [6]

(ii) Determine, in each case, whether the stationary point is a maximum or minimum point. [3]

(iii) Hence state the set of values of x for which $27 + 9x - 3x^2 - x^3$ is an increasing function. [2]

9 A is the point $(2, 7)$ and B is the point $(-1, -2)$.

(i) Find the equation of the line through A parallel to the line $y = 4x - 5$, giving your answer in the form $y = mx + c$. [3]

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

(iii) Find the equation of the line which passes through the mid-point of AB and which is perpendicular to AB. Give your answer in the form $ax + by + c = 0$, where a, b and c are integers. [6]

10 A circle has equation $x^2 + y^2 + 2x - 4y - 8 = 0$.

(i) Find the centre and radius of the circle. [3]

(ii) The circle passes through the point $(-3, k)$, where $k < 0$. Find the value of k. [3]

(iii) Find the coordinates of the points where the circle meets the line with equation $x + y = 6$. [6]