

**ADVANCED SUBSIDIARY GCE UNIT
MATHEMATICS**

Core Mathematics 1

TUESDAY 16 JANUARY 2007

4721/01

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 $\frac{5}{2 - \sqrt{3}}$ 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]

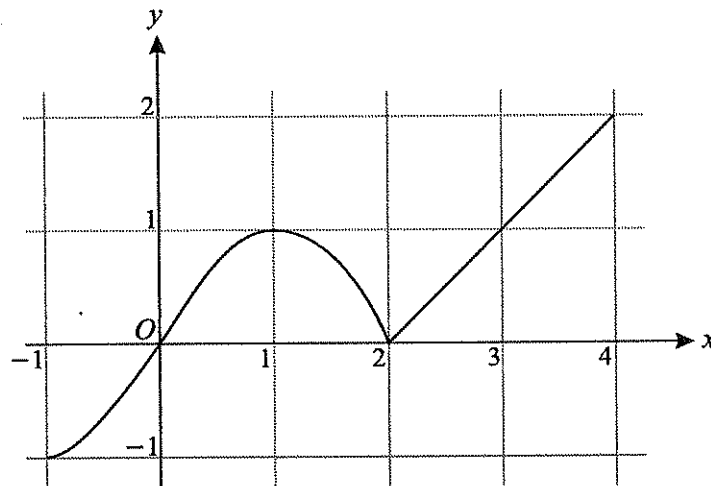
3 Solve the inequalities

(i) $3(x - 5) \leq 24$, [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 $-1 \leq x \leq 4$ is shown above.

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

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