

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

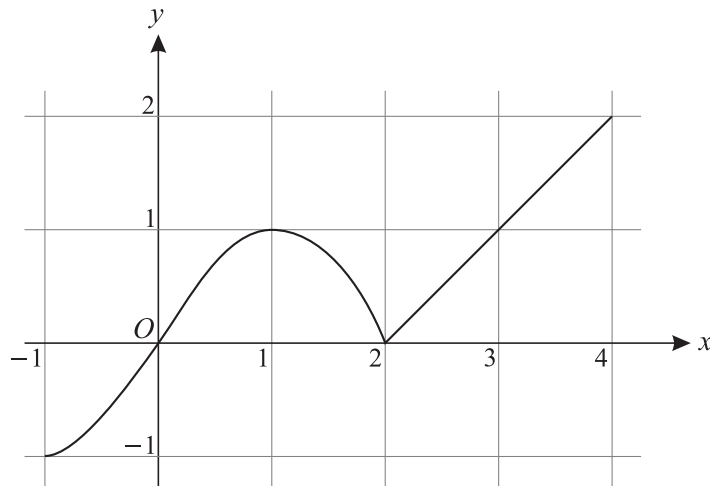
3 Solve the inequalities

(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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