

**ADVANCED SUBSIDIARY GCE  
MATHEMATICS**

**4721/01**

Core Mathematics 1

**THURSDAY 15 MAY 2008**

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.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- 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.
- **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 each of the following in the form  $4^n$ :
- (i)  $\frac{1}{16}$ , [1]
  - (ii) 64, [1]
  - (iii) 8. [2]
- 2
- (i) The curve  $y = x^2$  is translated 2 units in the positive  $x$ -direction. Find the equation of the curve after it has been translated. [2]
  - (ii) The curve  $y = x^3 - 4$  is reflected in the  $x$ -axis. Find the equation of the curve after it has been reflected. [1]
- 3 Express each of the following in the form  $k\sqrt{2}$ , where  $k$  is an integer:
- (i)  $\sqrt{200}$ , [1]
  - (ii)  $\frac{12}{\sqrt{2}}$ , [1]
  - (iii)  $5\sqrt{8} - 3\sqrt{2}$ . [2]
- 4 Solve the equation  $2x - 7x^{\frac{1}{2}} + 3 = 0$ . [5]
- 5 Find the gradient of the curve  $y = 8\sqrt{x} + x$  at the point whose  $x$ -coordinate is 9. [5]
- 6
- (i) Expand and simplify  $(x - 5)(x + 2)(x + 5)$ . [3]
  - (ii) Sketch the curve  $y = (x - 5)(x + 2)(x + 5)$ , giving the coordinates of the points where the curve crosses the axes. [3]
- 7 Solve the inequalities
- (i)  $8 < 3x - 2 < 11$ , [3]
  - (ii)  $y^2 + 2y \geq 0$ . [4]
- 8 The curve  $y = x^3 - kx^2 + x - 3$  has two stationary points.
- (i) Find  $\frac{dy}{dx}$ . [2]
  - (ii) Given that there is a stationary point when  $x = 1$ , find the value of  $k$ . [3]
  - (iii) Determine whether this stationary point is a minimum or maximum point. [2]
  - (iv) Find the  $x$ -coordinate of the other stationary point. [3]

- 9** (i) Find the equation of the circle with radius 10 and centre (2, 1), giving your answer in the form  $x^2 + y^2 + ax + by + c = 0$ . [3]
- (ii) The circle passes through the point (5,  $k$ ) where  $k > 0$ . Find the value of  $k$  in the form  $p + \sqrt{q}$ . [3]
- (iii) Determine, showing all working, whether the point (−3, 9) lies inside or outside the circle. [3]
- (iv) Find an equation of the tangent to the circle at the point (8, 9). [5]
- 10** (i) Express  $2x^2 - 6x + 11$  in the form  $p(x + q)^2 + r$ . [4]
- (ii) State the coordinates of the vertex of the curve  $y = 2x^2 - 6x + 11$ . [2]
- (iii) Calculate the discriminant of  $2x^2 - 6x + 11$ . [2]
- (iv) State the number of real roots of the equation  $2x^2 - 6x + 11 = 0$ . [1]
- (v) Find the coordinates of the points of intersection of the curve  $y = 2x^2 - 6x + 11$  and the line  $7x + y = 14$ . [5]

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