

**ADVANCED SUBSIDIARY GCE**

**MATHEMATICS**

Core Mathematics 1

**4721**

**QUESTION PAPER**

Candidates answer on the Printed Answer Book

**OCR Supplied Materials:**

- Printed Answer Book 4721
- List of Formulae (MF1)

**Other Materials Required:**

None

**Monday 24 May 2010**  
**Afternoon**

**Duration:** 1 hour 30 minutes

**INSTRUCTIONS TO CANDIDATES**

These instructions are the same on the Printed Answer Book and the Question Paper.

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the spaces provided on the Printed Answer Book.
- **The questions are on the inserted Question Paper.**
- **Write your answer to each question in the space provided in the Printed Answer Book.** Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are **not** permitted to use a calculator in this paper.
- 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.

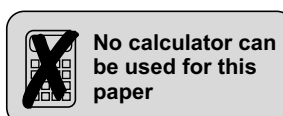
**INFORMATION FOR CANDIDATES**

This information is the same on the Printed Answer Book and the Question Paper.

- The number of marks is given in brackets [ ] at the end of each question or part question on the Question Paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question Paper consists of **4** pages. Any blank pages are indicated.

**INSTRUCTION TO EXAMS OFFICER / INVIGILATOR**

- Do not send this Question Paper for marking; it should be retained in the centre or destroyed.



- 1 (i) Evaluate  $9^0$ . [1]  
(ii) Express  $9^{-\frac{1}{2}}$  as a fraction. [2]
- 2 (i) Sketch the curve  $y = -\frac{1}{x^2}$ . [2]  
(ii) Sketch the curve  $y = 3 - \frac{1}{x^2}$ . [2]  
(iii) The curve  $y = -\frac{1}{x^2}$  is stretched parallel to the y-axis with scale factor 2. State the equation of the transformed curve. [1]
- 3 (i) Express  $\frac{12}{3 + \sqrt{5}}$  in the form  $a - b\sqrt{5}$ , where  $a$  and  $b$  are positive integers. [3]  
(ii) Express  $\sqrt{18} - \sqrt{2}$  in simplified surd form. [2]
- 4 (i) Expand  $(x - 2)^2(x + 1)$ , simplifying your answer. [3]  
(ii) Sketch the curve  $y = (x - 2)^2(x + 1)$ , indicating the coordinates of all intercepts with the axes. [3]
- 5 Find the real roots of the equation  $4x^4 + 3x^2 - 1 = 0$ . [5]
- 6 Find the gradient of the curve  $y = 2x + \frac{6}{\sqrt{x}}$  at the point where  $x = 4$ . [5]
- 7 Solve the simultaneous equations  
$$x + 2y - 6 = 0, \quad 2x^2 + y^2 = 57.$$
 [6]
- 8 (i) Express  $2x^2 + 5x$  in the form  $2(x + p)^2 + q$ . [3]  
(ii) State the coordinates of the minimum point of the curve  $y = 2x^2 + 5x$ . [2]  
(iii) State the equation of the normal to the curve at its minimum point. [1]  
(iv) Solve the inequality  $2x^2 + 5x > 0$ . [4]

- 9 (i) The line joining the points  $A(4, 5)$  and  $B(p, q)$  has mid-point  $M(-1, 3)$ . Find  $p$  and  $q$ . [3]  
 $AB$  is the diameter of a circle.
- (ii) Find the radius of the circle. [2]
- (iii) Find the equation of the circle, giving your answer in the form  $x^2 + y^2 + ax + by + c = 0$ . [3]
- (iv) Find an equation of the tangent to the circle at the point  $(4, 5)$ . [5]
- 10 (i) Find the coordinates of the stationary points of the curve  $y = 2x^3 + 5x^2 - 4x$ . [6]
- (ii) State the set of values for  $x$  for which  $2x^3 + 5x^2 - 4x$  is a decreasing function. [2]
- (iii) Show that the equation of the tangent to the curve at the point where  $x = \frac{1}{2}$  is  $10x - 4y - 7 = 0$ . [4]
- (iv) Hence, with the aid of a sketch, show that the equation  $2x^3 + 5x^2 - 4x = \frac{5}{2}x - \frac{7}{4}$  has two distinct real roots. [2]

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