

**Monday 13 May 2013 – Afternoon**

**AS GCE MATHEMATICS**

**4721/01** Core Mathematics 1

**QUESTION PAPER**

Candidates answer on the Printed Answer Book.

**OCR supplied materials:**

- Printed Answer book 4721/01
- List of Formulae (MF1)

**Other materials required:**

None

**Duration:** 1 hour 30 minutes



**INSTRUCTIONS TO CANDIDATES**

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

- The Question Paper will be found in the centre of the Printed Answer Book.
- Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.
- **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. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- 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.

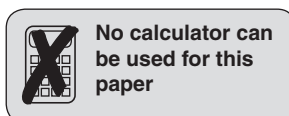
**INFORMATION FOR CANDIDATES**

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**

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No calculator can be used for this paper

- 1 Express each of the following in the form  $a\sqrt{5}$ , where  $a$  is an integer.
- (i)  $4\sqrt{15} \times \sqrt{3}$  [2]
- (ii)  $\frac{20}{\sqrt{5}}$  [1]
- (iii)  $5^{\frac{3}{2}}$  [1]
- 2 Solve the equation  $8x^6 + 7x^3 - 1 = 0$ . [5]
- 3 It is given that  $f(x) = \frac{6}{x^2} + 2x$ .
- (i) Find  $f'(x)$ . [3]
- (ii) Find  $f''(x)$ . [2]
- 4 (i) Express  $3x^2 + 9x + 10$  in the form  $3(x + p)^2 + q$ . [3]
- (ii) State the coordinates of the minimum point of the curve  $y = 3x^2 + 9x + 10$ . [2]
- (iii) Calculate the discriminant of  $3x^2 + 9x + 10$ . [2]
- 5 (i) Sketch the curve  $y = \frac{2}{x^2}$ . [2]
- (ii) The curve  $y = \frac{2}{x^2}$  is translated by 5 units in the negative  $x$ -direction. Find the equation of the curve after it has been translated. [2]
- (iii) Describe a transformation that transforms the curve  $y = \frac{2}{x^2}$  to the curve  $y = \frac{1}{x^2}$ . [2]
- 6 A circle  $C$  has equation  $x^2 + y^2 + 8y - 24 = 0$ .
- (i) Find the centre and radius of the circle. [3]
- (ii) The point  $A(2, 2)$  lies on the circumference of  $C$ . Given that  $AB$  is a diameter of the circle, find the coordinates of  $B$ . [2]
- 7 Solve the inequalities
- (i)  $3 - 8x > 4$ , [2]
- (ii)  $(2x - 4)(x - 3) \leq 12$ . [5]

- 8  $A$  is the point  $(-2, 6)$  and  $B$  is the point  $(3, -8)$ . The line  $l$  is perpendicular to the line  $x - 3y + 15 = 0$  and passes through the mid-point of  $AB$ . Find the equation of  $l$ , giving your answer in the form  $ax + by + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers. [7]
- 9 (i) Sketch the curve  $y = 2x^2 - x - 6$ , giving the coordinates of all points of intersection with the axes. [5]  
(ii) Find the set of values of  $x$  for which  $2x^2 - x - 6$  is a decreasing function. [3]  
(iii) The line  $y = 4$  meets the curve  $y = 2x^2 - x - 6$  at the points  $P$  and  $Q$ . Calculate the distance  $PQ$ . [4]
- 10 The curve  $y = (1 - x)(x^2 + 4x + k)$  has a stationary point when  $x = -3$ .  
(i) Find the value of the constant  $k$ . [7]  
(ii) Determine whether the stationary point is a maximum or minimum point. [2]  
(iii) Given that  $y = 9x - 9$  is the equation of the tangent to the curve at the point  $A$ , find the coordinates of  $A$ . [5]

**THERE ARE NO QUESTIONS PRINTED ON THIS PAGE**



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