

**ADVANCED SUBSIDIARY GCE  
MATHEMATICS (MEI)**

**4751**

Introduction to Advanced Mathematics (C1)

**QUESTION PAPER**

Candidates answer on the printed answer book.

**OCR supplied materials:**

- Printed answer book 4751
- MEI Examination Formulae and Tables (MF2)

**Other materials required:**

None

**Wednesday 18 May 2011  
Morning**

**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. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure 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.
- Final answers should be given to a degree of accuracy appropriate to the context.

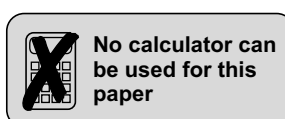
**INFORMATION FOR CANDIDATES**

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 advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
- 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.



## Section A (36 marks)

- 1 Solve the inequality  $6(x + 3) > 2x + 5$ . [3]
- 2 A line has gradient 3 and passes through the point  $(1, -5)$ . The point  $(5, k)$  is on this line. Find the value of  $k$ . [2]
- 3 (i) Evaluate  $\left(\frac{9}{16}\right)^{-\frac{1}{2}}$ . [2]
- (ii) Simplify  $\frac{(2ac^2)^3 \times 9a^2c}{36a^4c^{12}}$ . [3]
- 4 The point P  $(5, 4)$  is on the curve  $y = f(x)$ . State the coordinates of the image of P when the graph of  $y = f(x)$  is transformed to the graph of
- (i)  $y = f(x - 5)$ , [2]
- (ii)  $y = f(x) + 7$ . [2]
- 5 Find the coefficient of  $x^4$  in the binomial expansion of  $(5 + 2x)^6$ . [4]
- 6 Expand  $(2x + 5)(x - 1)(x + 3)$ , simplifying your answer. [3]
- 7 Find the discriminant of  $3x^2 + 5x + 2$ . Hence state the number of distinct real roots of the equation  $3x^2 + 5x + 2 = 0$ . [3]
- 8 Make  $x$  the subject of the formula  $y = \frac{1 - 2x}{x + 3}$ . [4]
- 9 A line  $L$  is parallel to the line  $x + 2y = 6$  and passes through the point  $(10, 1)$ . Find the area of the region bounded by the line  $L$  and the axes. [5]
- 10 Factorise  $n^3 + 3n^2 + 2n$ . Hence prove that, when  $n$  is a positive integer,  $n^3 + 3n^2 + 2n$  is always divisible by 6. [3]

## Section B (36 marks)

- 11 (i) Find algebraically the coordinates of the points of intersection of the curve  $y = 4x^2 + 24x + 31$  and the line  $x + y = 10$ . [5]
- (ii) Express  $4x^2 + 24x + 31$  in the form  $a(x + b)^2 + c$ . [4]
- (iii) For the curve  $y = 4x^2 + 24x + 31$ ,
- (A) write down the equation of the line of symmetry, [1]
- (B) write down the minimum  $y$ -value on the curve. [1]

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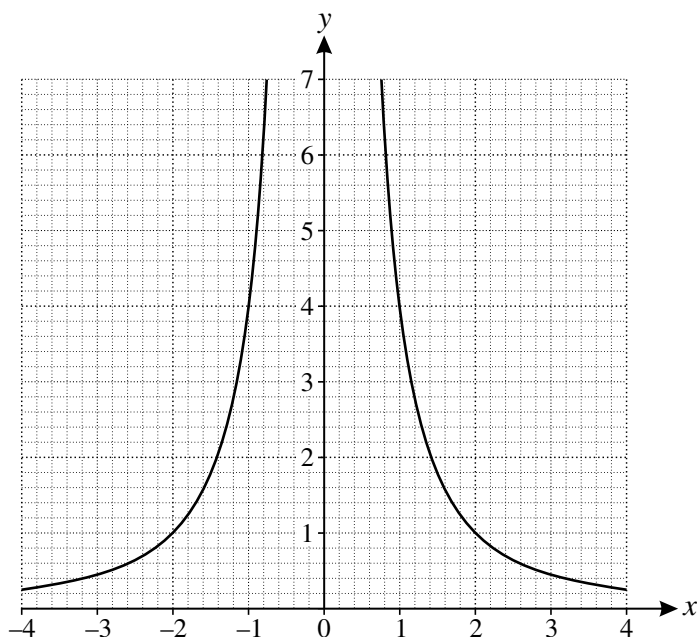


Fig. 12

Fig. 12 shows the graph of  $y = \frac{4}{x^2}$ .

- (i) On the copy of Fig. 12, draw accurately the line  $y = 2x + 5$  and hence find graphically the three roots of the equation  $\frac{4}{x^2} = 2x + 5$ . [3]
- (ii) Show that the equation you have solved in part (i) may be written as  $2x^3 + 5x^2 - 4 = 0$ . Verify that  $x = -2$  is a root of this equation and hence find, in exact form, the other two roots. [6]
- (iii) By drawing a suitable line on the copy of Fig. 12, find the number of real roots of the equation  $x^3 + 2x^2 - 4 = 0$ . [3]

[Question 13 is printed overleaf.]

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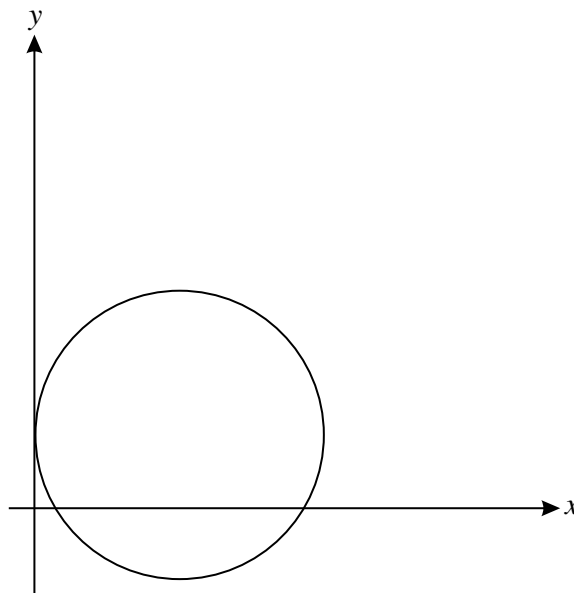


Fig. 13

Fig. 13 shows the circle with equation  $(x - 4)^2 + (y - 2)^2 = 16$ .

- (i) Write down the radius of the circle and the coordinates of its centre. [2]
- (ii) Find the  $x$ -coordinates of the points where the circle crosses the  $x$ -axis. Give your answers in surd form. [4]
- (iii) Show that the point A  $(4 + 2\sqrt{2}, 2 + 2\sqrt{2})$  lies on the circle and mark point A on the copy of Fig. 13.

Sketch the tangent to the circle at A and the other tangent that is parallel to it.

Find the equations of both these tangents. [7]

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