

**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.

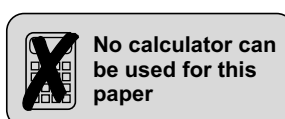
INFORMATION FOR CANDIDATES

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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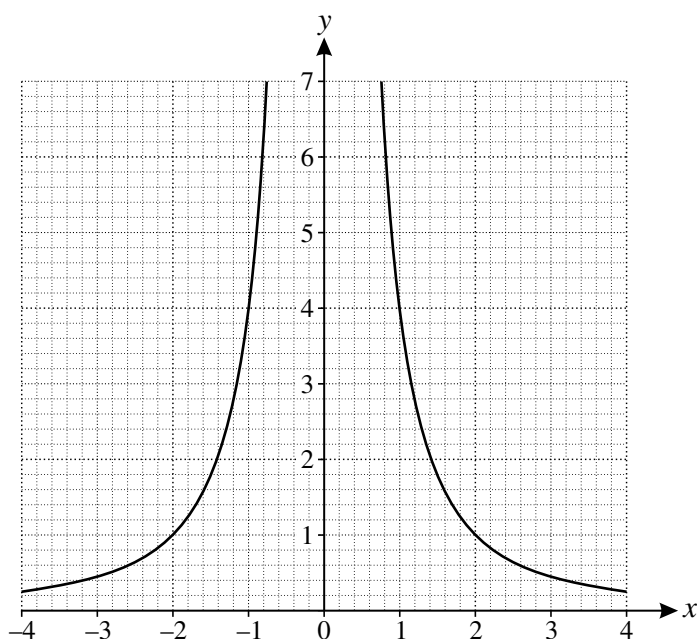


Fig. 12

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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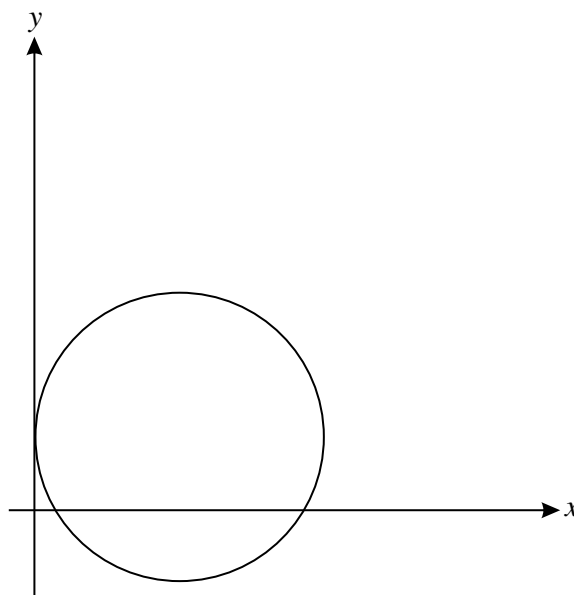


Fig. 13

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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