

**ADVANCED SUBSIDIARY GCE  
MATHEMATICS (MEI)**

Introduction to Advanced Mathematics (C1)

**4751**

**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.

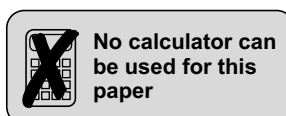
**INFORMATION FOR CANDIDATES**

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]

12

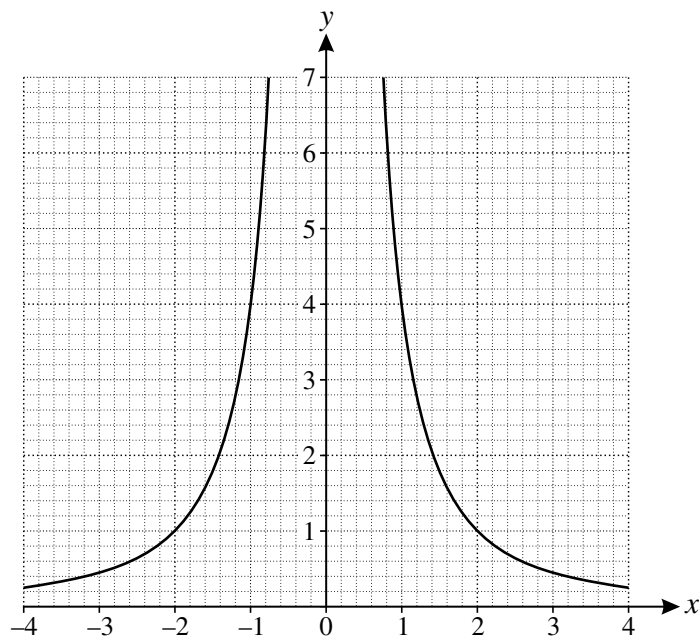


Fig. 12

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.]

13

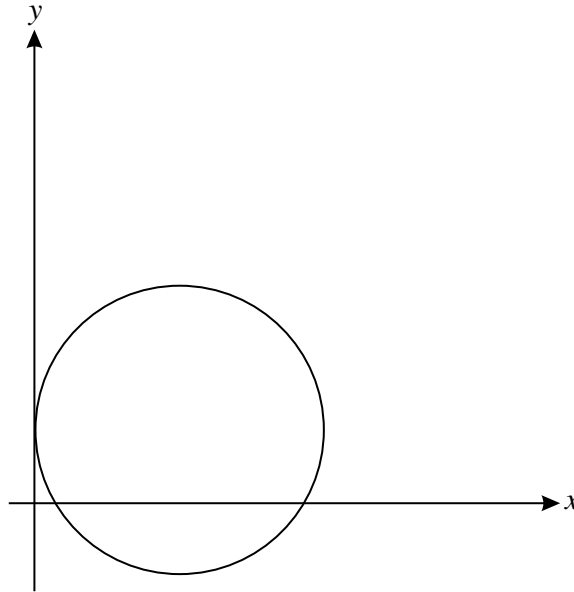


Fig. 13

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]

**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series. If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity. For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.