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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

Monday 10 January 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
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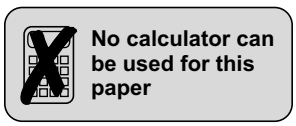
- The number of marks is given in brackets **[ ]** at the end of each question or part question on the question paper.
- You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
- The total number of marks 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.



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Section A (36 marks)

1 Find the equation of the line which is parallel to $y = 5x - 4$ and which passes through the point $(2, 13)$. Give your answer in the form $y = ax + b$. **[3]**

2 **(i)** Write down the value of each of the following.

(A) 4^{-2} **[1]**

(B) 9^0 **[1]**

(ii) Find the value of $\left(\frac{64}{125}\right)^{\frac{4}{3}}$. **[2]**

3 Simplify $\frac{(3xy^4)^3}{6x^5y^2}$. **[3]**

4 Solve the inequality $5 - 2x < 0$. **[2]**

5 The volume V of a cone with base radius r and slant height l is given by the formula

$$V = \tfrac{1}{3}\pi r^2\sqrt{l^2 - r^2}.$$

Rearrange this formula to make l the subject. **[4]**

6 Find the first 3 terms, in ascending powers of x, of the binomial expansion of $(2 - 3x)^5$, simplifying each term. **[4]**

7 **(i)** Express $\frac{81}{\sqrt{3}}$ in the form 3^k. **[2]**

(ii) Express $\frac{5 + \sqrt{3}}{5 - \sqrt{3}}$ in the form $\frac{a + b\sqrt{3}}{c}$, where a, b and c are integers. **[3]**

8 Find the coordinates of the point of intersection of the lines $x + 2y = 5$ and $y = 5x - 1$. **[3]**

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9 Fig. 9 shows a trapezium ABCD, with the lengths in centimetres of three of its sides.

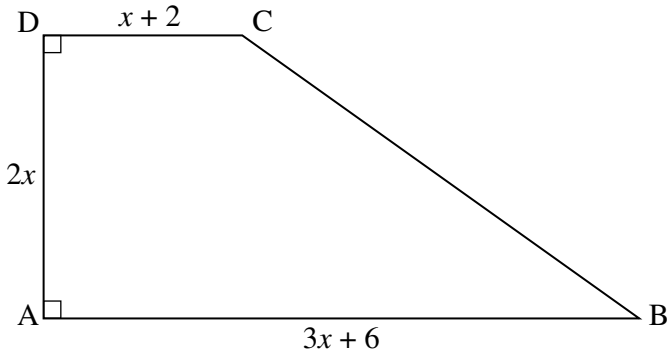

Fig. 9

This trapezium has area 140 cm^2.

(i) Show that $x^2 + 2x - 35 = 0$. **[2]**

(ii) Hence find the length of side AB of the trapezium. **[3]**

10 Select the best statement from

$P \Rightarrow Q$
$P \Leftarrow Q$
$P \Leftrightarrow Q$
none of the above

to describe the relationship between P and Q in each of the following cases.

(i) P : WXYZ is a quadrilateral with 4 equal sides
Q : WXYZ is a square

(ii) P : n is an odd integer
Q : $(n + 1)^2$ is an odd integer

(iii) P : n is greater than 1 and n is a prime number
Q : $\sqrt{n}$ is not an integer **[3]**

Section B (36 marks)

11 The points A (−1, 6), B (1, 0) and C (13, 4) are joined by straight lines.

(i) Prove that the lines AB and BC are perpendicular. **[3]**

(ii) Find the area of triangle ABC. **[3]**

(iii) A circle passes through the points A, B and C. Justify the statement that AC is a diameter of this circle. Find the equation of this circle. **[6]**

(iv) Find the coordinates of the point on this circle that is furthest from B. **[1]**

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12 **(i)** You are given that $f(x) = (2x - 5)(x - 1)(x - 4)$.

(*A*) Sketch the graph of $y = f(x)$. **[3]**

(*B*) Show that $f(x) = 2x^3 - 15x^2 + 33x - 20$. **[2]**

(ii) You are given that $g(x) = 2x^3 - 15x^2 + 33x - 40$.

(*A*) Show that $g(5) = 0$. **[1]**

(*B*) Express $g(x)$ as the product of a linear and quadratic factor. **[3]**

(*C*) Hence show that the equation $g(x) = 0$ has only one real root. **[2]**

(iii) Describe fully the transformation that maps $y = f(x)$ onto $y = g(x)$. **[2]**

13

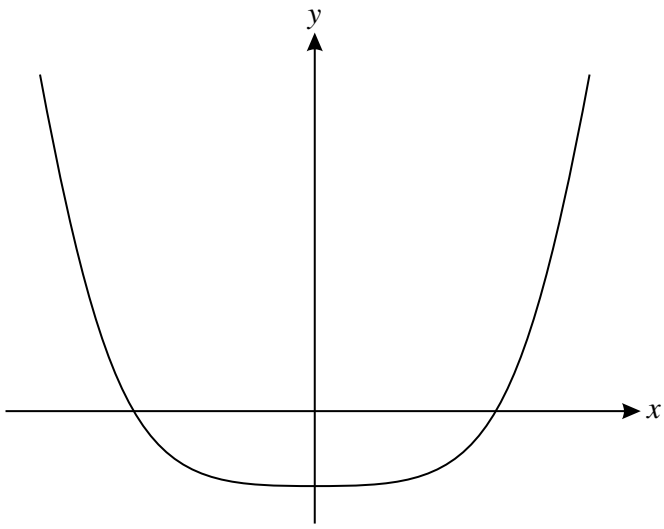

Fig. 13

Fig. 13 shows the curve $y = x^4 - 2$.

(i) Find the exact coordinates of the points of intersection of this curve with the axes. **[3]**

(ii) Find the exact coordinates of the points of intersection of the curve $y = x^4 - 2$ with the curve $y = x^2$. **[5]**

(iii) Show that the curves $y = x^4 - 2$ and $y = kx^2$ intersect for all values of k. **[2]**

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* 4 7 5 1 *

Candidate forename		Candidate surname	

Centre number						Candidate number				

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Section A (36 marks)

1	
2 (i) (*A*)	
2 (i) (*B*)	
2 (ii)	
3	

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4	
5	
6	

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7 (i)

7 (ii)

8

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9 (i)	
9 (ii)	
10 (i)	
10 (ii)	
10 (iii)	

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Section B (36 marks)

11 (i)	
11 (ii)	

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11 (iii)

11 (iv)

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12(i)(*A*)	
12(i)(*B*)	
12(ii)(*A*)	

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12(ii)(*B*)	
12(ii)(*C*)	
12 (iii)	

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13 (i)

13 (ii)

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13 (iii)	

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