

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
AS GCE**

4751/01

MATHEMATICS (MEI)

**Introduction to Advanced Mathematics
(C1)**

QUESTION PAPER

MONDAY 19 MAY 2014: Morning

**DURATION: 1 hour 30 minutes
plus your additional time allowance**

MODIFIED ENLARGED

Candidates answer on the Printed Answer Book, or any suitable paper provided by the centre. The Printed Answer Book may be enlarged by the centre.

OCR SUPPLIED MATERIALS:

Printed Answer Book 4751/01

MEI Examination Formulae and Tables (MF2)

Insert for questions 3 and 12

OTHER MATERIALS REQUIRED:

None

No calculator can be used for this paper

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book or on the paper provided by the centre. Please write clearly and in capital letters.

If you use the Printed Answer Book, write your answer to each question in the space provided. 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.

Read each question carefully. Make sure you know what you have to do before starting your answer.

Answer ALL the questions.

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

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**.

INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

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SECTION A (36 marks)

1 (i) Evaluate $\left(\frac{1}{27}\right)^{\frac{2}{3}}$. [2]

(ii) Simplify $\frac{(4a^2c)^3}{32a^4c^7}$. [3]

2 A is the point (1, 5) and B is the point (6, -1). M is the midpoint of AB. Determine whether the line with equation $y = 2x - 5$ passes through M. [3]

3 Look at the following diagram.

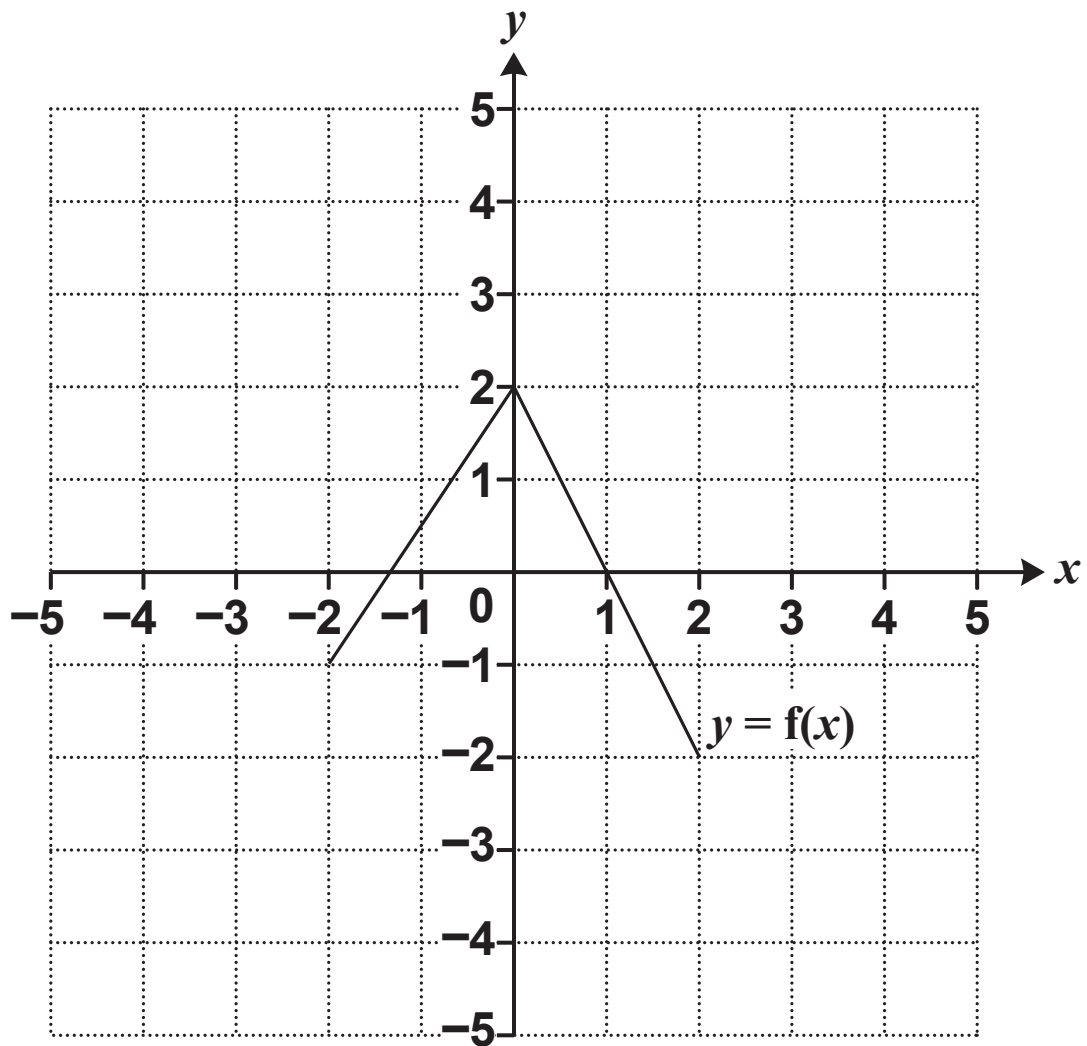


FIG. 3

Fig. 3 above shows the graph of $y = f(x)$. Draw the graphs of the following. You may use the insert.

- (i) $y = f(x) - 2$ [2]**
- (ii) $y = f(x - 3)$ [2]**

- 4 (i) Expand and simplify $(7 - 2\sqrt{3})^2$. [3]
- (ii) Express $\frac{20\sqrt{6}}{\sqrt{50}}$ in the form $a\sqrt{b}$, where a and b are integers and b is as small as possible. [2]
- 5 Make a the subject of $3(a + 4) = ac + 5f$. [4]
- 6 Solve the inequality $3x^2 + 10x + 3 > 0$. [3]
- 7 Find the coefficient of x^4 in the binomial expansion of $(5 + 2x)^7$. [4]
- 8 You are given that $f(x) = 4x^3 + kx + 6$, where k is a constant. When $f(x)$ is divided by $(x - 2)$, the remainder is 42. Use the remainder theorem to find the value of k . Hence find a root of $f(x) = 0$. [4]
- 9 You are given that n , $n + 1$ and $n + 2$ are three consecutive integers.
- (i) Expand and simplify $n^2 + (n + 1)^2 + (n + 2)^2$. [2]
- (ii) For what values of n will the sum of the squares of these three consecutive integers be an even number? Give a reason for your answer. [2]

SECTION B (36 marks)

- 10 Fig. 10 below shows a sketch of a circle with centre $C(4, 2)$. The circle intersects the x -axis at $A(1, 0)$ and at B .

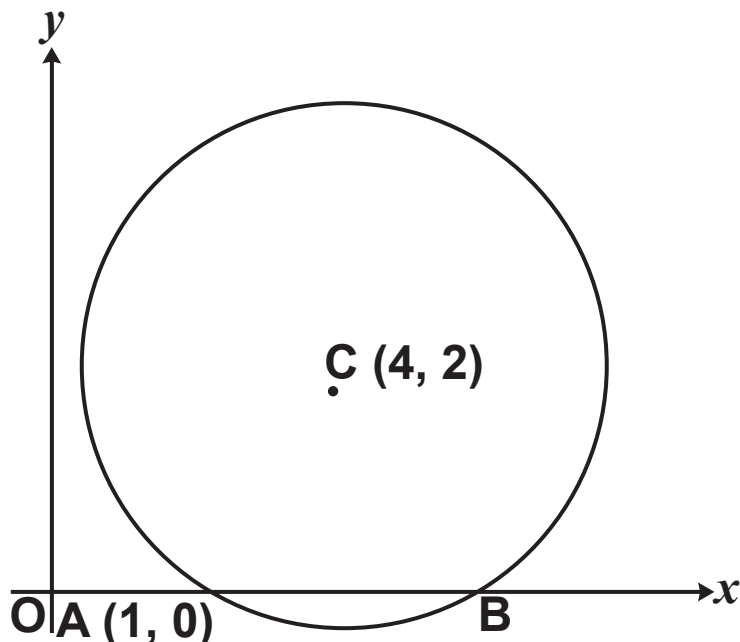


FIG. 10

- (i) Write down the coordinates of B . [1]
- (ii) Find the radius of the circle and hence write down the equation of the circle. [4]
- (iii) AD is a diameter of the circle. Find the coordinates of D . [2]
- (iv) Find the equation of the tangent to the circle at D . Give your answer in the form $y = ax + b$. [4]

11 Look at the following diagram.

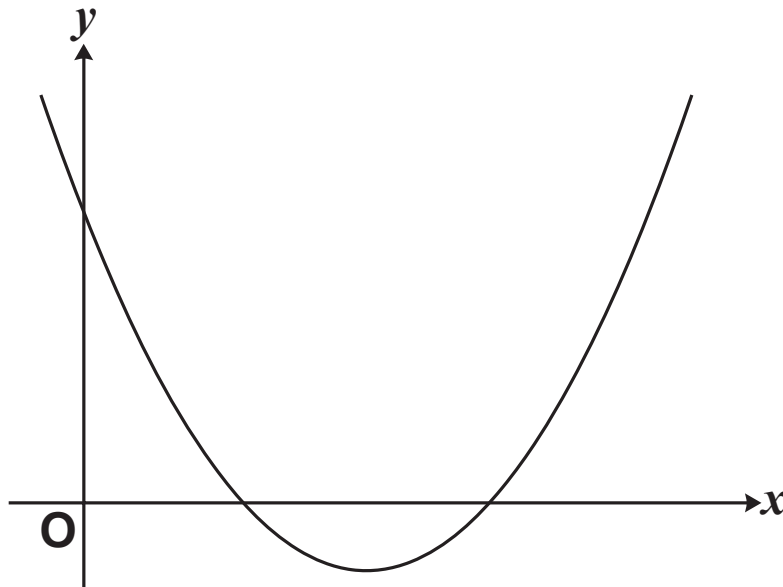


FIG. 11

Fig. 11 above shows a sketch of the curve with equation $y = (x - 4)^2 - 3$.

- (i) Write down the equation of the line of symmetry of the curve and the coordinates of the minimum point. [2]**
- (ii) Find the coordinates of the points of intersection of the curve with the x -axis and the y -axis, using surds where necessary. [4]**
- (iii) The curve is translated by $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$. Show that the equation of the translated curve may be written as $y = x^2 - 12x + 33$. [2]**
- (iv) Show that the line $y = 8 - 2x$ meets the curve $y = x^2 - 12x + 33$ at just one point, and find the coordinates of this point. [5]**

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Question 12 begins on page 10

12 Fig. 12 opposite shows the graph of a cubic curve. It intersects the axes at $(-5, 0)$, $(-2, 0)$, $(1.5, 0)$ and $(0, -30)$.

- (i) Use the intersections with both axes to express the equation of the curve in a factorised form. [2]**
- (ii) Hence show that the equation of the curve may be written as $y = 2x^3 + 11x^2 - x - 30$. [2]**
- (iii) Draw the line $y = 5x + 10$ accurately on the copy of the graph on the insert. The curve and this line intersect at $(-2, 0)$; find graphically the x -coordinates of the other points of intersection. [3]**
- (iv) Show algebraically that the x -coordinates of the other points of intersection satisfy the equation**

$$2x^2 + 7x - 20 = 0.$$

Hence find the exact values of the x -coordinates of the other points of intersection. [5]

END OF QUESTION PAPER

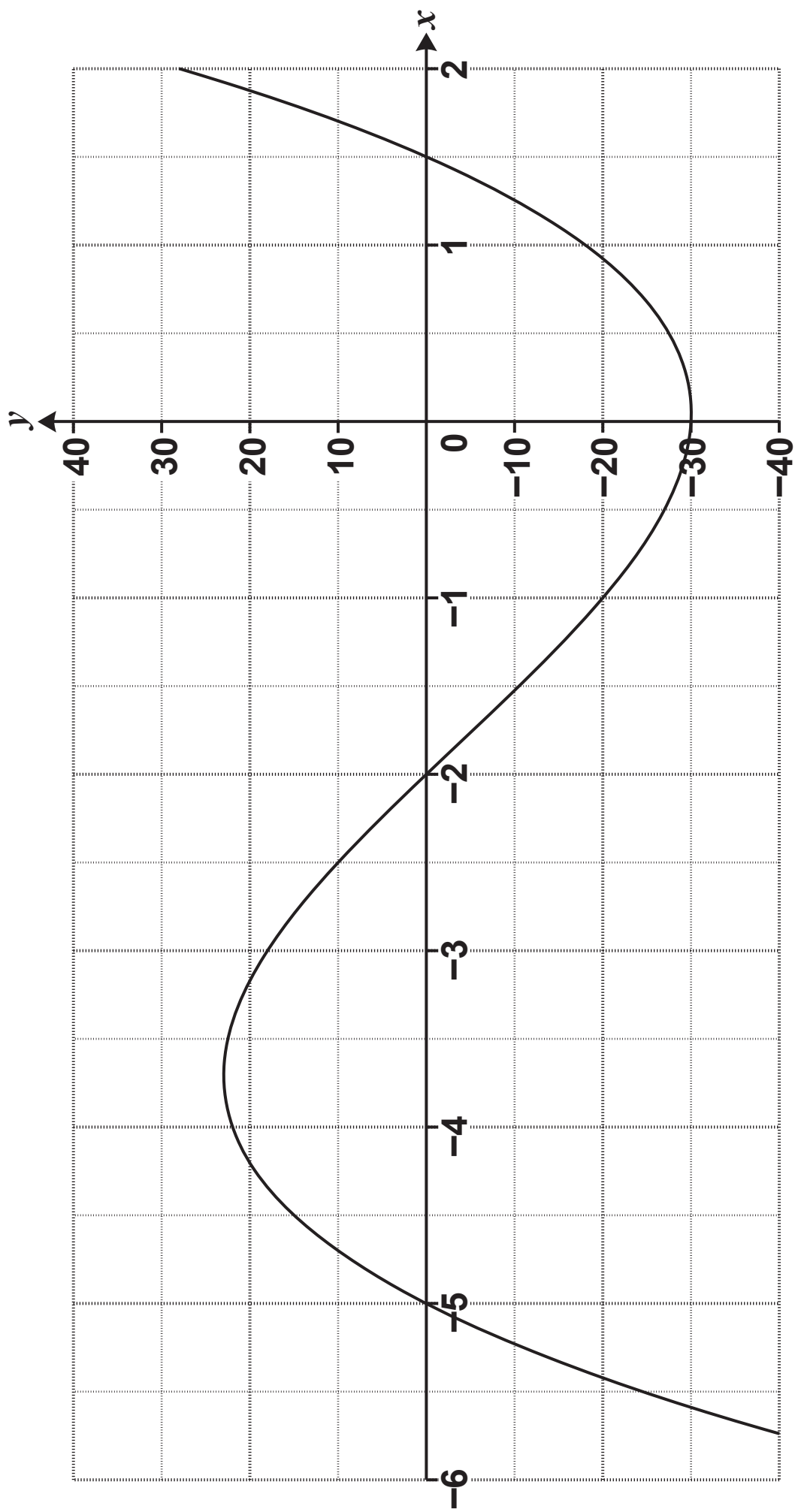


FIG. 12



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