



Monday 19 May 2014 – Morning

AS GCE MATHEMATICS (MEI)

4751/01 Introduction to Advanced Mathematics (C1)

QUESTION PAPER



Candidates answer on the Printed Answer Book.

OCR supplied materials:

- Printed Answer Book 4751/01
- MEI Examination Formulae and Tables (MF2)

Other materials required:

None

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 inside 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. 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.
- 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.

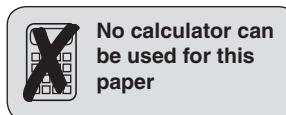
INFORMATION FOR CANDIDATES

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 **8** pages. Any blank pages are indicated.

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

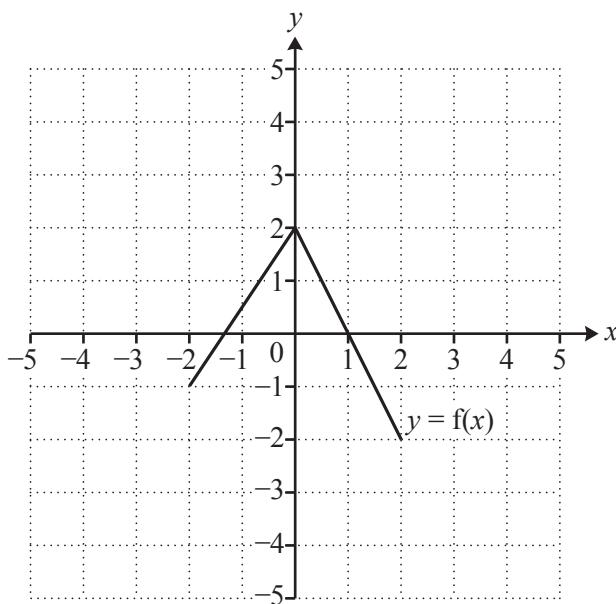


Fig. 3

Fig. 3 shows the graph of $y = f(x)$. Draw the graphs of the following.

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

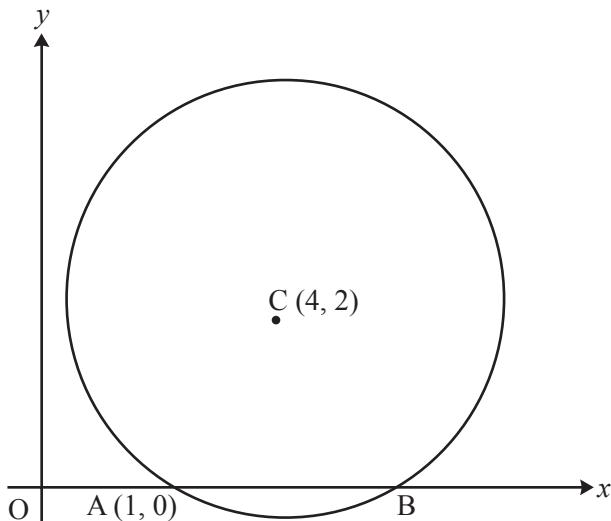


Fig. 10

(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

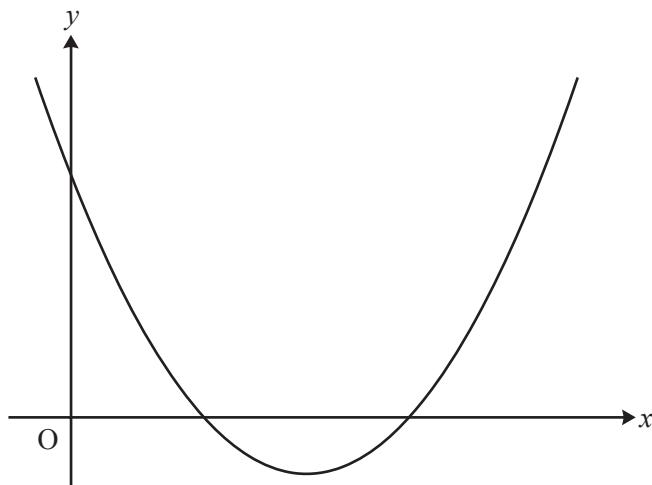


Fig. 11

Fig. 11 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]

12

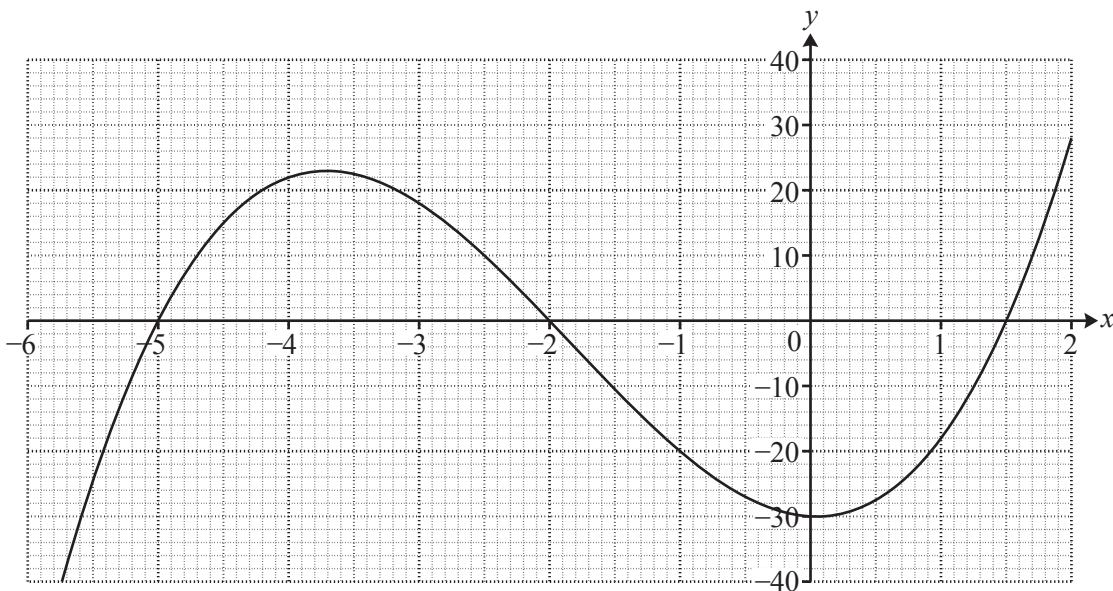


Fig. 12

Fig. 12 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 graph. 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

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