OCR
RECOGNISING ACHIEVEMENT

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 24 May 2010
Afternoon

Duration: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES
These instructions are the same on the Printed Answer Book and the Question Paper.

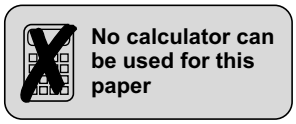
- Write your name clearly in capital letters, your Centre Number and Candidate Number in the spaces provided on the Printed Answer Book.
- **The questions are on the inserted Question Paper.**
- **Write your answer to each question in the space provided in the Printed Answer Book.** Additional paper 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 and make sure that 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 Find the equation of the line which is parallel to $y = 3x + 1$ and which passes through the point with coordinates (4, 5). **[3]**

2 **(i)** Simplify $(5a^2b)^3 \times 2b^4$. **[2]**

(ii) Evaluate $\left(\frac{1}{16}\right)^{-1}$. **[1]**

(iii) Evaluate $(16)^{\frac{3}{2}}$. **[2]**

3 Make y the subject of the formula $a = \dfrac{\sqrt{y} - 5}{c}$. **[3]**

4 Solve the following inequalities.

(i) $2(1 - x) > 6x + 5$ **[3]**

(ii) $(2x - 1)(x + 4) < 0$ **[2]**

5 **(i)** Express $\sqrt{48} + \sqrt{27}$ in the form $a\sqrt{3}$. **[2]**

(ii) Simplify $\dfrac{5\sqrt{2}}{3 - \sqrt{2}}$. Give your answer in the form $\dfrac{b + c\sqrt{2}}{d}$. **[3]**

6 You are given that

- the coefficient of x^3 in the expansion of $(5 + 2x^2)(x^3 + kx + m)$ is 29,
- when $x^3 + kx + m$ is divided by $(x - 3)$, the remainder is 59.

Find the values of k and m. **[5]**

7 Expand $\left(1 + \frac{1}{2}x\right)^4$, simplifying the coefficients. **[4]**

8 Express $5x^2 + 20x + 6$ in the form $a(x + b)^2 + c$. **[4]**

9 Show that the following statement is false.

$$x - 5 = 0 \iff x^2 = 25$$ **[2]**

Section B (36 marks)

10 **(i)** Solve, by factorising, the equation $2x^2 - x - 3 = 0$. **[3]**

(ii) Sketch the graph of $y = 2x^2 - x - 3$. **[3]**

(iii) Show that the equation $x^2 - 5x + 10 = 0$ has no real roots. **[2]**

(iv) Find the x-coordinates of the points of intersection of the graphs of $y = 2x^2 - x - 3$ and $y = x^2 - 5x + 10$. Give your answer in the form $a \pm \sqrt{b}$. **[4]**

11

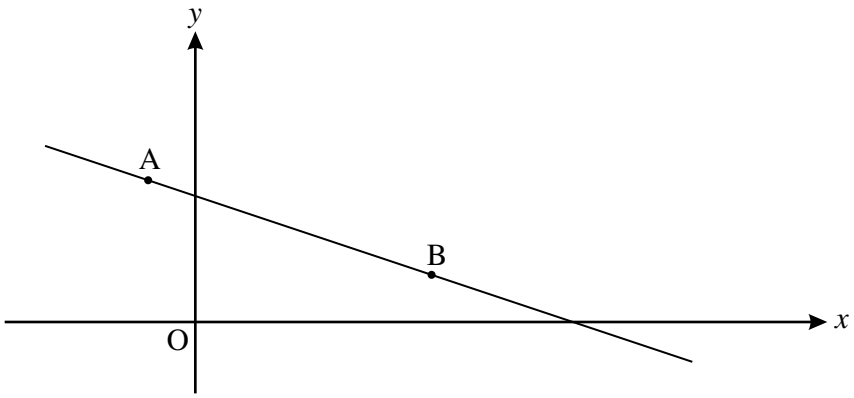


Fig. 11

Fig. 11 shows the line through the points A (−1, 3) and B (5, 1).

(i) Find the equation of the line through A and B. **[3]**

(ii) Show that the area of the triangle bounded by the axes and the line through A and B is $\frac{32}{3}$ square units. **[2]**

(iii) Show that the equation of the perpendicular bisector of AB is $y = 3x - 4$. **[3]**

(iv) A circle passing through A and B has its centre on the line $x = 3$. Find the centre of the circle and hence find the radius and equation of the circle. **[4]**

12 You are given that $f(x) = x^3 + 6x^2 - x - 30$.

(i) Use the factor theorem to find a root of $f(x) = 0$ and hence factorise $f(x)$ completely. **[6]**

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

(iii) The graph of $y = f(x)$ is translated by $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$.

Show that the equation of the translated graph may be written as

$$y = x^3 + 3x^2 - 10x - 24.$$ **[3]**