OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE UNIT **4751/01**

MATHEMATICS (MEI)

Introduction to Advanced Mathematics (C1)

THURSDAY 7JUNE 2007

Morning
Time: 1 hour 30 minutes

Additional materials:
Answer booklet (8 pages)
MEI Examination Formulae and Tables (MF2)

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the spaces provided on the answer booklet.
- 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.
- The total number of marks for this paper is 72.

ADVICE TO CANDIDATES

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

WARNING

You are not allowed to use a calculator in this paper

[Turn over

Section A (36 marks)

1 Solve the inequality $1 - 2x < 4 + 3x$. [3]

2 Make t the subject of the formula $s = \frac{1}{2}at^2$. [3]

3 The converse of the statement 'P $\Rightarrow$ Q' is 'Q $\Rightarrow$ P'.

Write down the converse of the following statement.

'n is an odd integer $\Rightarrow$ $2n$ is an even integer.'

Show that this converse is false. [2]

4 You are given that $f(x) = x^3 + kx + c$. The value of $f(0)$ is 6, and $x - 2$ is a factor of $f(x)$.

Find the values of k and c. [3]

5 **(i)** Find a, given that $a^3 = 64x^{12}y^3$. [2]

(ii) Find the value of $\left(\frac{1}{2}\right)^{-5}$. [2]

6 Find the coefficient of x^3 in the expansion of $(3 - 2x)^5$. [4]

7 Solve the equation $\frac{4x + 5}{2x} = -3$. [3]

8 **(i)** Simplify $\sqrt{98} - \sqrt{50}$. [2]

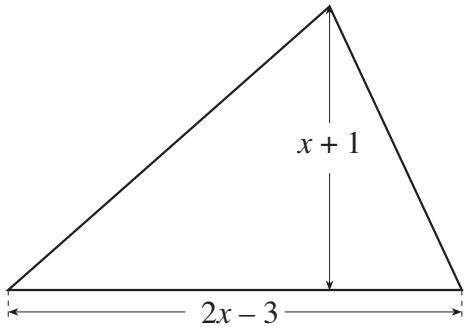
(ii) Express $\frac{6\sqrt{5}}{2 + \sqrt{5}}$ in the form $a + b\sqrt{5}$, where a and b are integers. [3]

9 **(i)** A curve has equation $y = x^2 - 4$. Find the x-coordinates of the points on the curve where $y = 21$. [2]

(ii) The curve $y = x^2 - 4$ is translated by $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$.

Write down an equation for the translated curve. You need not simplify your answer. [2]

10 The triangle shown in Fig. 10 has height $(x + 1)$ cm and base $(2x - 3)$ cm. Its area is 9 cm^2.



Not to scale

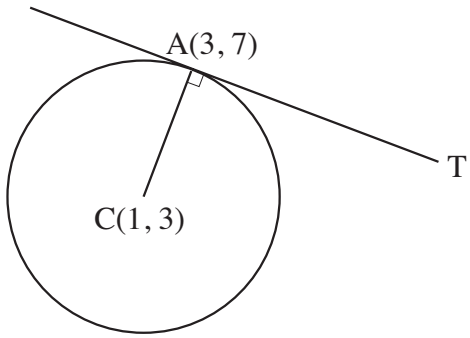
Fig. 10

(i) Show that $2x^2 - x - 21 = 0$. [2]

(ii) By factorising, solve the equation $2x^2 - x - 21 = 0$. Hence find the height and base of the triangle. [3]

Section B (36 marks)

11



Not to scale

Fig. 11

A circle has centre C$(1, 3)$ and passes through the point A$(3, 7)$ as shown in Fig. 11.

(i) Show that the equation of the tangent at A is $x + 2y = 17$. [4]

(ii) The line with equation $y = 2x - 9$ intersects this tangent at the point T.

Find the coordinates of T. [3]

(iii) The equation of the circle is $(x - 1)^2 + (y - 3)^2 = 20$.

Show that the line with equation $y = 2x - 9$ is a tangent to the circle. Give the coordinates of the point where this tangent touches the circle. [5]

[Turn over

12 **(i)** Write $4x^2 - 24x + 27$ in the form $a(x - b)^2 + c$. [4]

(ii) State the coordinates of the minimum point on the curve $y = 4x^2 - 24x + 27$. [2]

(iii) Solve the equation $4x^2 - 24x + 27 = 0$. [3]

(iv) Sketch the graph of the curve $y = 4x^2 - 24x + 27$. [3]

13 A cubic polynomial is given by $\mathrm{f}(x) = 2x^3 - x^2 - 11x - 12$.

(i) Show that $(x - 3)(2x^2 + 5x + 4) = 2x^3 - x^2 - 11x - 12$.

Hence show that $\mathrm{f}(x) = 0$ has exactly one real root. [4]

(ii) Show that $x = 2$ is a root of the equation $\mathrm{f}(x) = -22$ and find the other roots of this equation. [5]

(iii) Using the results from the previous parts, sketch the graph of $y = \mathrm{f}(x)$. [3]