ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2010

Mathematics

Assessment Unit C1

assessing

Module C1: AS Core Mathematics 1

[AMC11]

MONDAY 11 JANUARY, MORNING

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number on the Answer Booklet provided.
Answer **all eight** questions.
Show clearly the full development of your answers.
Answers should be given to three significant figures unless otherwise stated.
You are not permitted to use any calculating aid in this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
A copy of the **Mathematical Formulae and Tables booklet** is provided.

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Answer all eight questions.

Show clearly the full development of your answers.

Answers should be given to three significant figures unless otherwise stated.

You are not permitted to use any calculating aid in this paper.

1   **Fig. 1** below shows a sketch of the graph of the function $y = f(x)$
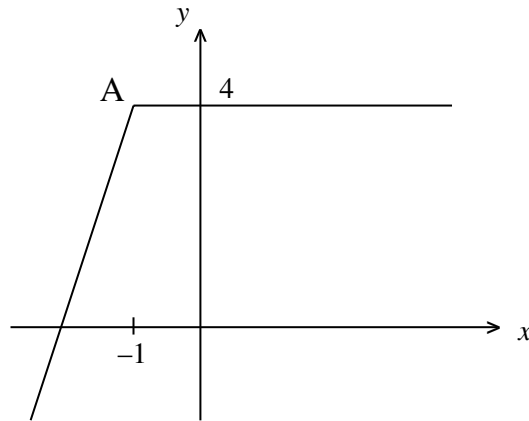

Fig. 1

Point A has coordinates $(-1, 4)$

Sketch, on separate diagrams, the graphs of:

(i) $y = f(x - 4)$ [2]

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

clearly identifying the image of the point A.

2   The tariffs for a certain mobile phone company are set out below.

All calls cost x pence per minute.
Text messages cost y pence each.
Picture messages cost z pence each.

Colin made 60 minutes of calls, sent 20 text messages and sent 10 picture messages.
His bill was £18.00
Diane made 100 minutes of calls, sent 30 text messages and sent 5 picture messages.
Her bill was £25.00
Frank made 80 minutes of calls, sent 40 text messages and sent 15 picture messages.
His bill was £26.00

By forming and solving three simultaneous equations find the values of x, y and z. [9]

3 Points A and B have coordinates (1, 5) and (–2, *y*) respectively.

(i) Find an expression for the gradient of the straight line joining A and B. [2]

Point C has coordinates (2, –3)
The angle ABC is 90°

(ii) Find the possible values of *y* [5]

4 (a) Simplify as far as possible

$$\left[(3x - 1)(2x + 3) - 2(4x - 1) \right] \div \frac{3x + 1}{3x - 1}$$ [6]

(b) The area of a rectangular garden is (20 + 4√5) m²
The length of one side is (3 + √5) m
Find the length of the other side of the garden in the form *a* + *b*√5, where *a* and *b* are rational numbers. [5]

(c) Solve the equation

$$\frac{16^x}{2^{x-1}} = 2^{\frac{1}{2}}$$ [6]

5 **(i)** Express

$$x^2 - 8x + 7$$

in the form $(x + p)^2 + q$ [3]

(ii) **Hence** state the minimum value of

$$x^2 - 8x + 7$$

and the value of x at which it occurs. [2]

(iii) Solve the equation

$$8x - x^2 - 7 = 0$$ [3]

(iv) Sketch the curve

$$y = 8x - x^2 - 7$$ [2]

6 **(i)** If

$$f(x) = 25x^3 - 50x^2 - 4x + 8$$

find f(2) [2]

(ii) Hence factorise fully the expression

$$25x^3 - 50x^2 - 4x + 8$$ [4]

(iii) Hence solve the equation

$$25x^3 + 8 = 50x^2 + 4x$$ [3]

7 **(a)** A curve is given by the equation

$$y = 2x^3 - 4x^2 - 3$$

(i) Find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ [3]

(ii) Hence find the equation of the tangent to this curve at the point where $x = 2$ [4]

(b) The profit made by a company t years after it has been set up is given by the equation

$$P = 16\sqrt{t} + \frac{27}{t} \qquad (0 < t < 10)$$

Find the time during which the company's profit is increasing. [5]

8 A curve has equation

$$y = 3x^2 - 2$$

A straight line has equation

$$y = mx - 5$$

The line does not meet the curve.
Find the range of possible values of m. [7]

THIS IS THE END OF THE QUESTION PAPER