Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2015

Mathematics

Assessment Unit C1

assessing

Module C1: AS Core Mathematics 1

AMC11

[AMC11]

WEDNESDAY 20 MAY, 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.

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 $y = \mathrm{f}(x)$

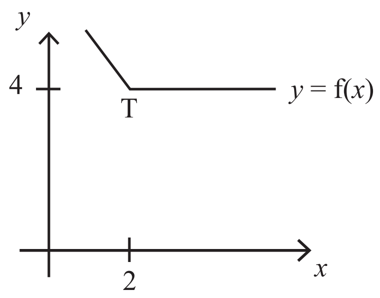

Fig. 1

Point T has coordinates (2, 4).
Sketch, on separate diagrams, the graphs of:

(i) $y = \mathrm{f}(x - 3)$ [2]

(ii) $y = \mathrm{f}(2x)$ [2]

clearly labelling the image of the point T.

(iii) Write down, using function notation, the two possible single transformations of $y = \mathrm{f}(x)$ which each map the point T onto the point (2, 8). [2]

2 The points A and B have coordinates $(a, -2a)$ and $(3, 10)$ respectively.

(i) The gradient of the line AB is 2
Show that $a = -1$ [3]

(ii) Hence find the equation of the line perpendicular to AB passing through the point $(5, 4)$.
Leave your answer in the form $ax + by + c = 0$, where a, b and c are integers. [4]

3 **(a)** Simplify

$$\left[(2x-1)(x+4) - 2(8x-7)\right] \div \frac{(2x-5)}{(x+2)}$$ [6]

(b) Solve the simultaneous equations

$$\begin{aligned} x + 2y - z &= 9 \\ 3x - 4z &= 13 \\ 4x + y - 2z &= 7 \end{aligned}$$ [6]

4 $f(x)$ is the expression $2x^3 + 5x^2 + px + q$

$f(x)$ has factors $(x - 1)$ and $(x + 3)$.

(i) Using the Factor Theorem, find the values of p and q. [6]

(ii) Hence find the remainder when $f(x)$ is divided by $(2x - 1)$. [2]

5 **(a)** Differentiate

$$7x - \frac{\sqrt{x}}{3} + \frac{1}{4x}$$ [3]

(b) Sketch the curve with equation

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

clearly indicating all relevant points. [10]

6 **(a)** Solve

$$5^{4x-3} \times (0.2)^x = \sqrt{5}$$ [6]

(b) Find the range of values of x for which

$$x^2 - 5\sqrt{2}\,x + 12 < 0$$ [5]

7 **Fig. 2** below shows a candle in the shape of a solid right circular cone.

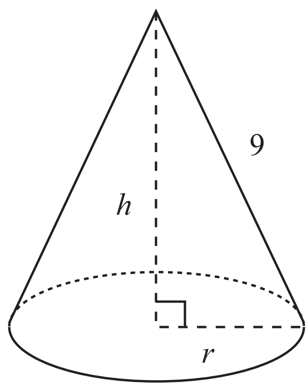

Fig. 2

The candle has base radius r cm, perpendicular height h cm and slant height 9 cm.
[Volume of cone = $\frac{1}{3}\pi r^2 h$]

(i) Show that the volume of the cone can be expressed as

$$V = 27\pi h - \frac{1}{3}\pi h^3$$ [4]

(ii) Hence find, in its simplest form, the ratio $h : r$ for which the volume is a maximum. [9]

8 Show that the equation

$$kx^2 + (2k + 1)x + (1 - k) = 0$$

has real distinct roots for all non-zero real values of k. [5]

THIS IS THE END OF THE QUESTION PAPER