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2016

Mathematics

Assessment Unit C1
assessing
Module C1: AS Core Mathematics 1

AMC11

[AMC11]
WEDNESDAY 18 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.

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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.

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1 Simplify as far as possible

$$\frac{1 - \sqrt{5}}{\sqrt{5} + 3}$$ [5]

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

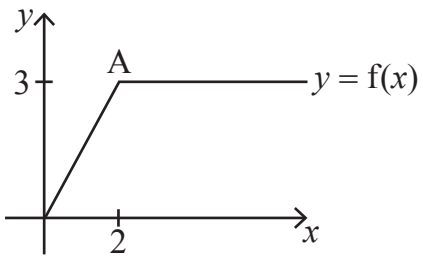

Fig. 1

Point A has coordinates (2, 3).

Sketch, on separate diagrams, the graphs of:

(i) $y = f(x) + 1$ [2]

(ii) $y = f(\frac{1}{2}x)$ [2]

clearly labelling the image of the point A.

(iii) When $y = f(x + a)$ is sketched, the point A maps onto the point with coordinates (6, 3).

Write down the value of a. [1]

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3 Solve

$$\frac{81}{3^{x-1}} = \sqrt{27}$$

[6]

4 **(a)** Simplify as far as possible

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

[5]

(b) The straight line L_1 has equation $y - 2x + 1 = 0$

The straight line L_2 passes through the point (4, 2).

L_2 is perpendicular to L_1

Find the coordinates of the point of intersection of L_1 and L_2 [6]

5 **(a)** The polynomial f(x) is given by

$$f(x) = 2x^3 - 7x^2 - 42x + k$$

where k is a constant.

(i) Given that $(x + 4)$ is a factor of f(x), show that $k = 72$ [3]

(ii) Express f(x) as a product of linear factors. [4]

(b) When the expression $(x^3 + 1)$ is divided by $(x + c)$, the remainder is $\frac{35}{8}$

By using the Remainder Theorem, find the value of c. [3]

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

$$y = x^3 + ax^2 + bx$$

where a and b are constants.

The curve has stationary points at $x = 2$ and $x = -\frac{4}{3}$

Find the values of a and b. [7]

(b) A curve is given by the equation

$$y = \frac{\sqrt[3]{x}}{2} + \frac{8}{x} + 1$$

(i) Find $\frac{dy}{dx}$ [3]

(ii) Hence find the equation of the tangent to the curve at the point where $x = 8$
Leave your answer in the form $ax + by + c = 0$, where a, b and c are integers. [4]

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7 A tailor has a piece of cloth in the shape of a right-angled triangle as shown in **Fig. 2** below.

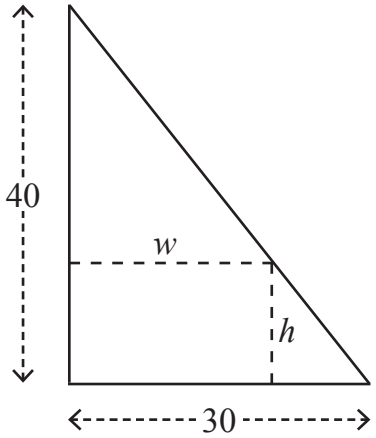

Fig. 2

The piece of cloth has base length 30 cm and perpendicular height 40 cm.
The tailor wants to cut out a rectangle from this piece of cloth.
The rectangle has width w cm and height h cm.

(i) Show that the area of the rectangle can be expressed as

$$A = 40w - \frac{4w^2}{3}$$

[6]

(ii) Using calculus, find the values of w and h for which A is a maximum. [6]

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8 **(a)** The quadratic equation

$$(k + 1)x^2 + 6x + (k - 2) = 0$$

has real roots.

Find the range of values of k. [7]

(b) A quadratic equation has the form

$$x^2 + bx + c = 0$$

The roots of this equation are n and $(n + 1)$, where n is a positive integer.

Find the value of $b^2 - 4c$ [5]

THIS IS THE END OF THE QUESTION PAPER

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