Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2010

Mathematics

Assessment Unit C1

assessing

Module C1: AS Core Mathematics 1

[AMC11]

AMC11

WEDNESDAY 9 JUNE, AFTERNOON

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 A and B are the points (4, –7) and (–2, 3) respectively.

(i) Find the midpoint P of AB. [1]

(ii) Find the equation of the line through P which is perpendicular to AB. [5]

2 When divided by $(x + 1)$ the expression

$$ax^3 - 3x^2 + bx + 6$$

has a remainder of 12

(i) Write down an equation connecting a and b. [3]

The expression

$$ax^3 - 3x^2 + bx + 6$$

has a factor of $(x - 3)$.

(ii) Write down a second equation connecting a and b. [2]

(iii) Hence find the values of a and b. [2]

3 The diagram in **Fig. 1** below shows the graph of the curve $y = f(x)$.
The point A, (5, 4), lies on the curve.

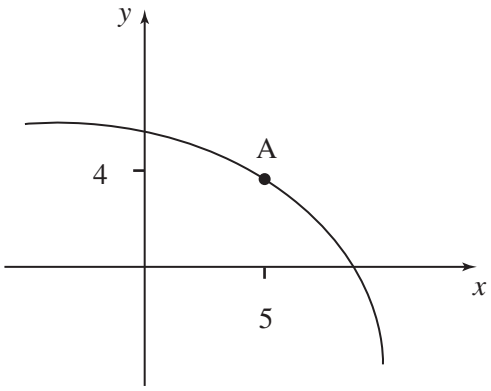

Fig. 1

Sketch, on separate diagrams, the graphs of:

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

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

(iii) $y = f(2x)$ [2]

clearly indicating the image of the point A on each sketch.

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

$$\frac{9x^2 - 4}{2x + 1} \div \frac{3x - 2}{6x + 3}$$ [5]

(b) Rationalise the denominator of

$$\frac{3 - \sqrt{7}}{\sqrt{7} - 2}$$ [4]

(c) Solve the equation

$$3^{x+1} = \frac{27^x}{9}$$ [5]

5 A curve has the equation

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

(i) Find $\frac{dy}{dx}$ [2]

(ii) Find the x coordinates of the stationary points on the curve and determine their nature. [7]

6 **(i)** Sketch the graph of the curve

$$y = \frac{10}{x}$$ [2]

(ii) On the same diagram, sketch the line

$$y = 3x + 13$$ [1]

(iii) Find the coordinates of the points of intersection of the curve $y = \frac{10}{x}$ and the line $y = 3x + 13$ [6]

7 **(a)** A rectangular field has a width of $2x$ metres.
Its length is $(x + 10)$ metres.
The area of the field is $800\,m^2$

(i) Show that

$$x^2 + 10x - 400 = 0$$ [2]

(ii) Hence find in surd form, the width and length of the field. [4]

(b) Find the range of values of p for which the equation

$$px^2 - 3x + (5 - p) = 0$$

has two distinct roots. [7]

8 A sports field is to be built in the shape of a rectangle with a semicircle on each end as shown in **Fig. 2** below.

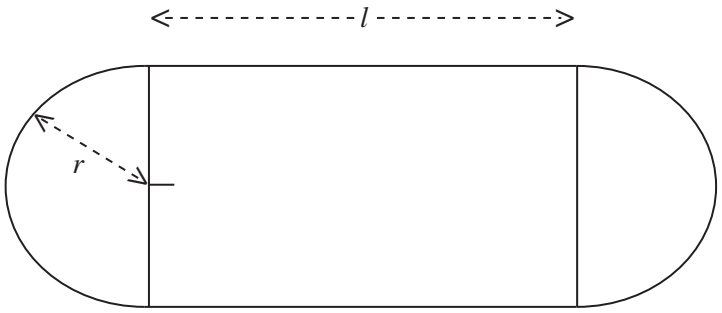

Fig. 2

The length of the rectangle is l metres and the radius of the semicircle is r metres.

(i) Write down an expression in terms of l and r for the perimeter of the sports field. [1]

The perimeter of the sports field must be 400 m long.

(ii) Find an expression for l in terms of r. [2]

(iii) Using calculus, find the dimensions of the sports field which maximise the area of the **rectangle**. [8]

THIS IS THE END OF THE QUESTION PAPER