



*Rewarding Learning*

ADVANCED SUBSIDIARY (AS)

General Certificate of Education

January 2011

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## Mathematics

### Assessment Unit C1

*assessing*

### Module C1: AS Core Mathematics 1

[AMC11]

MONDAY 10 JANUARY, MORNING

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#### 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 (i)** If

$$y = 5x + 4x^3$$

find  $\frac{dy}{dx}$  [2]

**(ii)** Hence find the coordinates of the points on the curve

$$y = 5x + 4x^3$$

at which the gradient is 8 [4]

**2 (a) (i)** Using the Factor Theorem, show that  $(x + 3)$  is a factor of

$$2x^3 + x^2 - 13x + 6$$
 [2]

**(ii)** Hence fully factorise the expression

$$2x^3 + x^2 - 13x + 6$$
 [3]

**(iii)** Hence solve the equation

$$2x^3 + x^2 - 13x + 6 = 0$$
 [3]

**(b)** The remainder when the function

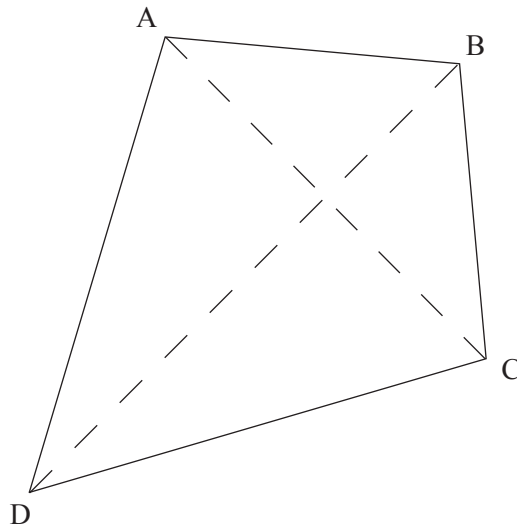
$$f(x) = px^4 - 2x^3 - 4x - 6$$

is divided by  $(x - 2)$  is six times the remainder when it is divided by  $(x + 1)$ .  
Find  $p$ . [5]

**3** Simplify to a single algebraic fraction

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

- 4 Points A, B, C and D form the vertices of a kite as shown in **Fig. 1** below.

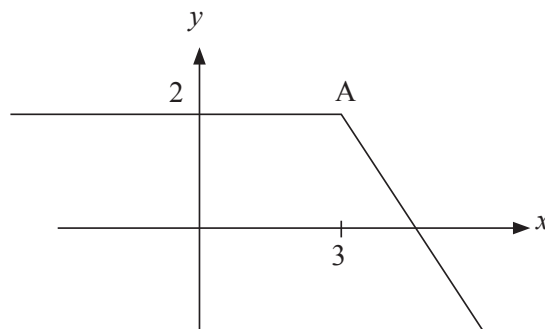


**Fig. 1**

Point A has coordinates (2, 1) and point C has coordinates (4, -5).  
Find the equation of the diagonal BD.

[6]

- 5 (a) The graph of the function  $y = f(x)$  is sketched in **Fig. 2** below.



**Fig. 2**

Draw a sketch of the graph of  $y = f(x + 2)$  clearly labelling the image of point A.

[2]

- (b) A rectangle has an area of  $12 \text{ cm}^2$   
Its length is  $(\sqrt{7} + 2) \text{ cm}$ .  
Find the width of the rectangle in the form  $(a\sqrt{b} + c)$ .

[5]

- (c) Solve the equation

$$x^{\frac{1}{3}} = 2 + 15x^{-\frac{1}{3}}$$

[6]

6 The number of bacteria  $b$  in a Petri dish after time  $t$  hours can be modelled by the equation

$$b = 4t + \frac{64}{\sqrt{t}} + 7 \quad t > 0$$

(i) Find the number of bacteria after 16 hours. [1]

(ii) Find the rate of change of the number of bacteria after  $t$  hours. [3]

(iii) Hence find the range of values of  $t$  for which the number of bacteria is increasing. [3]

7 (i) Find the coordinates of the points where the curve

$$y = x(9 - x^2)$$

crosses the  $x$ -axis. [3]

(ii) Find the coordinates of the turning points on the curve

$$y = 9x - x^3$$

and determine their nature. [9]

(iii) Hence sketch the graph of the curve  $y = 9x - x^3$  [2]

8 A rectangular sheet of cardboard has width  $x$  cm and an area of  $48 \text{ cm}^2$ . Small **squares** of side 2 cm are removed from each corner and the sides are folded up to form an open box.

The volume of the box must be more than  $16 \text{ cm}^3$

(i) Show that

$$x^2 - 14x + 48 < 0 \quad [6]$$

(ii) Hence find the possible range of values of  $x$ . [4]

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**THIS IS THE END OF THE QUESTION PAPER**

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