WJEC CBAC

GCE AS/A level

0974/01

MATHEMATICS – C2
Pure Mathematics

A.M. FRIDAY, 17 May 2013

1½ hours

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- a 12 page answer book;
- a Formula Booklet;
- a calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Answer **all** questions.

Sufficient working must be shown to demonstrate the **mathematical** method employed.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

1. Use the Trapezium Rule with five ordinates to find an approximate value for the integral

$$\int_0^2 \frac{1}{2+x^3}\,\mathrm{d}x.$$

Show your working and give your answer correct to three decimal places. [4]

2. *(a)* (i) Show that the equation

$$6\cos\theta + 5\tan\theta = 0$$

may be rewritten in the form

$$6\sin^2\theta - 5\sin\theta - 6 = 0.$$

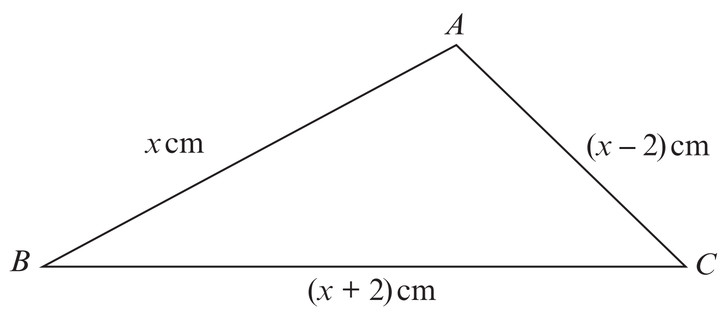
(ii) Hence find all values of θ in the range $0^\circ \leqslant \theta \leqslant 360^\circ$ satisfying the equation

$$6\cos\theta + 5\tan\theta = 0.$$ [7]

(b) Find all values of x in the range $0^\circ \leqslant x \leqslant 180^\circ$ satisfying

$$\cos(2x - 60^\circ) = 0{\cdot}788.$$ [3]

3. The diagram below shows a sketch of the triangle ABC with $AB = x$ cm, $AC = (x - 2)$ cm and $BC = (x + 2)$ cm.



(a) Show that $\cos B\hat{A}C = \dfrac{x-8}{2x-4}$. [3]

(b) Given that $B\hat{A}C = 120^\circ$,

(i) find the value of x,

(ii) find the size of $A\hat{B}C$. [4]

4. *(a)* An arithmetic series has first term a and common difference d. Prove that the sum of the first n terms of the series is given by

$$S_n = \frac{n}{2}\left[2a + (n-1)d\right]. \qquad [3]$$

(b) The sum of the first ten terms of an arithmetic series is 115. The sum of the **next** four terms of this series is 130. Find the first term and the common difference of the arithmetic series. [5]

5. *(a)* Find the sum of the first eighteen terms of the geometric series

$$100 + 80 + 64 + ...$$

Give your answer correct to the nearest whole number. [3]

(b) The second term of a geometric series is -20. The sum to infinity of the series is 64.

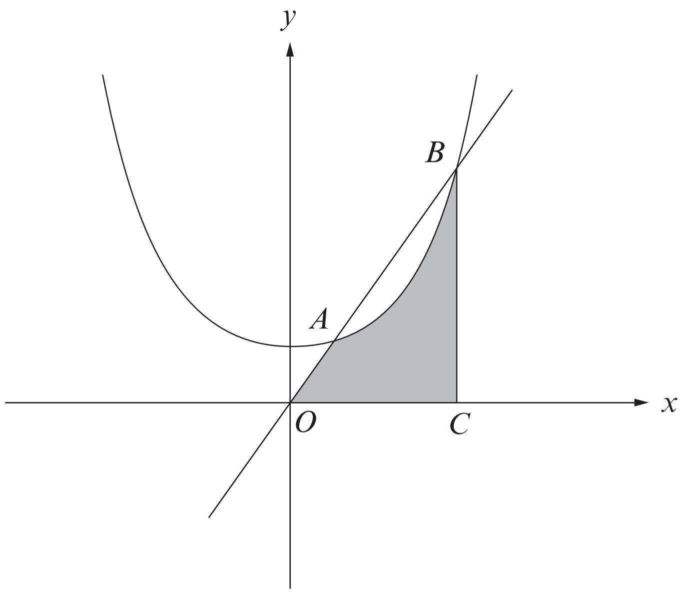
(i) Show that r, the common ratio of the series, satisfies the equation

$$16r^2 - 16r - 5 = 0.$$

(ii) Find the value of r, giving a reason for your answer. [6]

6. *(a)* Find $\int\left(\sqrt[4]{x} + \frac{2}{x^5}\right)\mathrm{d}x.$ [2]

(b)



The diagram shows a sketch of the curve $y = x^2 + 3$ and the line $y = 4x$. The curve and the line intersect at the points A and B.
The line BC is parallel to the y-axis.

(i) Showing your working, find the x-coordinates of A and B.

(ii) Find the area of the shaded region. [9]

TURN OVER

7. *(a)* Given that $x > 0$, $y > 0$, show that

$$\log_a xy = \log_a x + \log_a y.$$ [3]

(b) Solve the equation

$$5^{2-3x} = 8.$$

Show your working and give your answer correct to three decimal places. [3]

(c) Solve the equation

$$\log_a 90x^2 - \log_a\left(\frac{5}{x}\right) = \frac{1}{2}\log_a 144x^8.$$ [4]

8. The circle C_1 has centre A and equation

$$x^2 + y^2 + 2x - 6y - 15 = 0.$$

(a) Find the coordinates of A and the radius of C_1. [3]

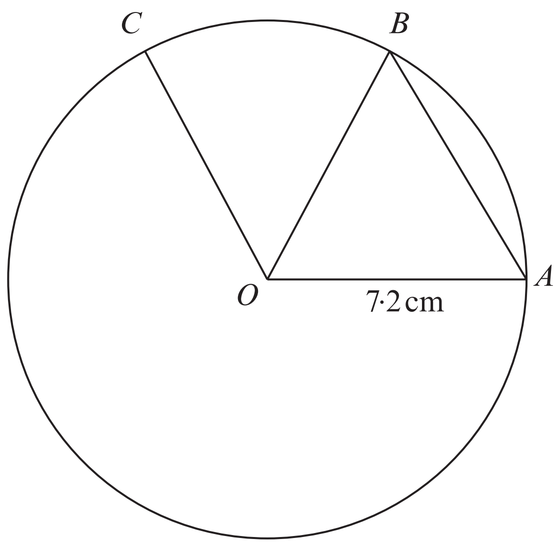
(b) The line L has equation $y = -x + 9$.

(i) Show that L is not a diameter of C_1.

(ii) Find the coordinates of the points of intersection of L and C_1. [5]

(c) The circle C_2 has centre $B(11, 8)$ and radius 6. Find the shortest distance between the circles C_1 and C_2. [3]

9.



The diagram shows three points A, B and C on a circle with centre O and radius 7·2cm.

(a) Given that $A\hat{O}B = 1{\cdot}1$ radians, find the area of **triangle** AOB. Give your answer correct to one decimal place. [2]

(b) The area of **sector** BOC is $19{\cdot}44\,\text{cm}^2$. Find the length of the **arc** BC. [3]