

ADVANCED SUBSIDIARY GCE MATHEMATICS

4722/01

Core Mathematics 2

WEDNESDAY 9 JANUARY 2008

Afternoon

Time: 1 hour 30 minutes

Additional materials: Answer Booklet (8 pages)

List of Formulae (MF1)

INSTRUCTIONS TO CANDIDATES

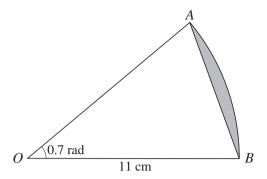
- Write your name, centre number and candidate number in the spaces provided on the answer booklet.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.
- You are permitted to use a graphical calculator in this paper.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is 72.
- You are reminded of the need for clear presentation in your answers.

This document consists of 4 printed pages.

1



The diagram shows a sector AOB of a circle with centre O and radius 11 cm. The angle AOB is 0.7 radians. Find the area of the segment shaded in the diagram. [4]

2 Use the trapezium rule, with 3 strips each of width 2, to estimate the value of

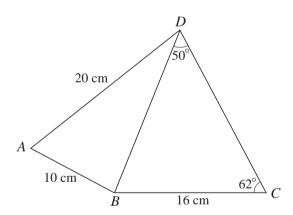
$$\int_{1}^{7} \sqrt{x^2 + 3} \, \mathrm{d}x. \tag{4}$$

3 Express each of the following as a single logarithm:

(i)
$$\log_a 2 + \log_a 3$$
, [1]

(ii)
$$2\log_{10} x - 3\log_{10} y$$
. [3]

4



In the diagram, angle $BDC = 50^{\circ}$ and angle $BCD = 62^{\circ}$. It is given that AB = 10 cm, AD = 20 cm and BC = 16 cm.

(i) Find the length of
$$BD$$
. [2]

The gradient of a curve is given by $\frac{dy}{dx} = 12\sqrt{x}$. The curve passes through the point (4, 50). Find the equation of the curve.

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6 A sequence of terms u_1, u_2, u_3, \ldots is defined by

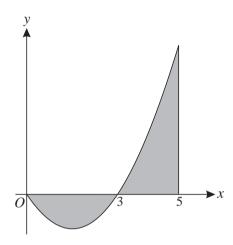
$$u_n = 2n + 5$$
, for $n \ge 1$.

(i) Write down the values of u_1 , u_2 and u_3 . [2]

(ii) State what type of sequence it is. [1]

(iii) Given that $\sum_{n=1}^{N} u_n = 2200$, find the value of N. [5]

7



The diagram shows part of the curve $y = x^2 - 3x$ and the line x = 5.

(i) Explain why $\int_0^5 (x^2 - 3x) dx$ does not give the total area of the regions shaded in the diagram. [1]

(ii) Use integration to find the exact total area of the shaded regions. [7]

8 The first term of a geometric progression is 10 and the common ratio is 0.8.

(i) Find the fourth term. [2]

(ii) Find the sum of the first 20 terms, giving your answer correct to 3 significant figures. [2]

(iii) The sum of the first N terms is denoted by S_N , and the sum to infinity is denoted by S_∞ . Show that the inequality $S_\infty - S_N < 0.01$ can be written as

$$0.8^N < 0.0002$$
,

and use logarithms to find the smallest possible value of N. [7]

(i)

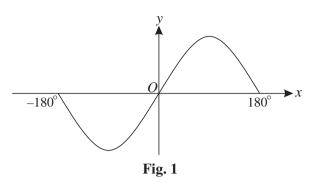


Fig. 1 shows the curve $y = 2 \sin x$ for values of x such that $-180^{\circ} \le x \le 180^{\circ}$. State the coordinates of the maximum and minimum points on this part of the curve. [2]

(ii)

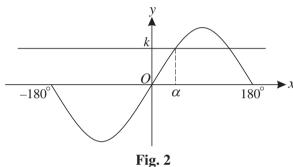


Fig. 2 shows the curve $y = 2 \sin x$ and the line y = k. The smallest positive solution of the equation $2\sin x = k$ is denoted by α . State, in terms of α , and in the range $-180^{\circ} \le x \le 180^{\circ}$,

- (a) another solution of the equation $2 \sin x = k$, [1]
- **(b)** one solution of the equation $2 \sin x = -k$. [1]
- (iii) Find the x-coordinates of the points where the curve $y = 2 \sin x$ intersects the curve $y = 2 3 \cos^2 x$, for values of x such that $-180^{\circ} \le x \le 180^{\circ}$. [6]
- (i) Find the binomial expansion of $(2x + 5)^4$, simplifying the terms. 10 [4]
 - (ii) Hence show that $(2x+5)^4 (2x-5)^4$ can be written as

$$320x^3 + kx$$
.

where the value of the constant k is to be stated.

[2]

(iii) Verify that x = 2 is a root of the equation

$$(2x+5)^4 - (2x-5)^4 = 3680x - 800,$$

and find the other possible values of x.

[6]

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