



**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.

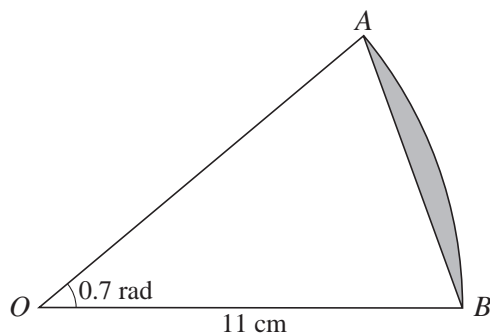
INFORMATION FOR CANDIDATES

- 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.

2

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

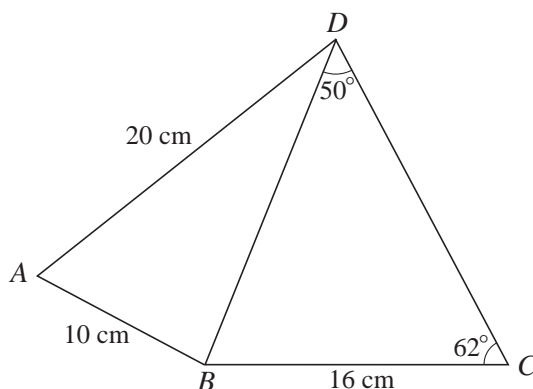
$$\int_1^7 \sqrt{x^2 + 3} \, dx. \quad [4]$$

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]

(ii) Find angle BAD . [3]

5 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. [6]

3

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

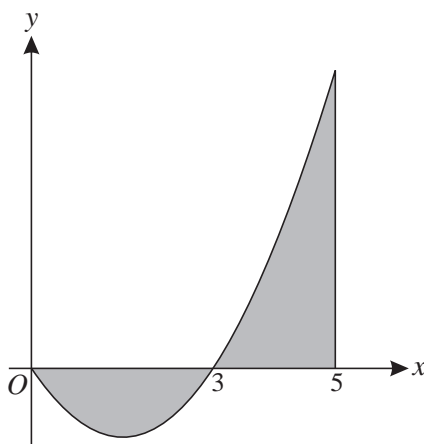
$$u_n = 2n + 5, \quad \text{for } n \geq 1.$$

(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]

4

9 (i)

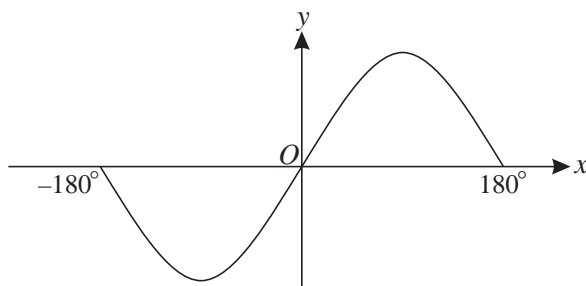


Fig. 1

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

(ii)

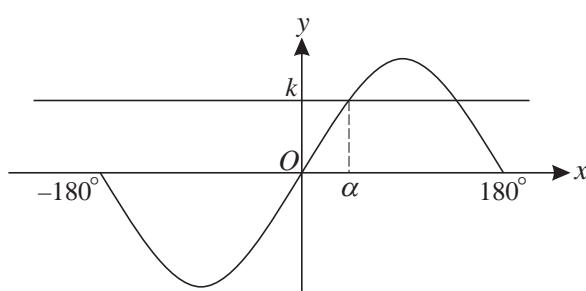


Fig. 2

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 $-180^\circ \leq x \leq 180^\circ$,

(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 $-180^\circ \leq x \leq 180^\circ$. [6]

10 (i) Find the binomial expansion of $(2x + 5)^4$, simplifying the terms. [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]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

OCR is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.