

**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**

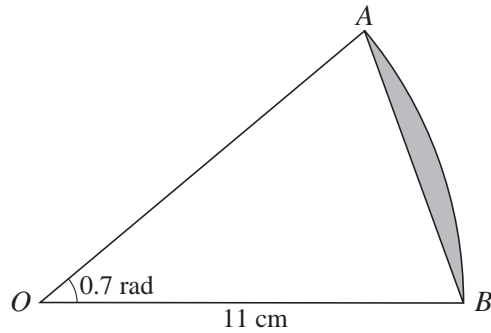
- Write your name, centre number and candidate number in the spaces provided on the answer booklet.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Give non-exact numerical answers correct to 3 significant figures 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

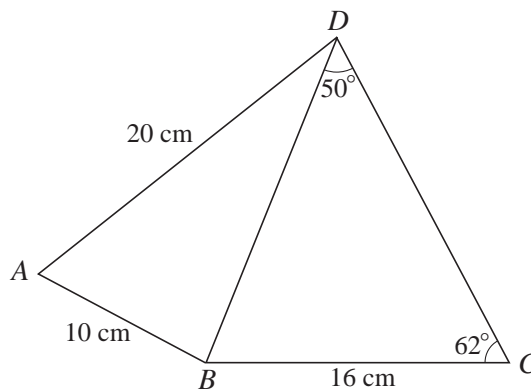
$$\int_1^7 \sqrt{x^2 + 3} \, dx. \quad [4]$$

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]

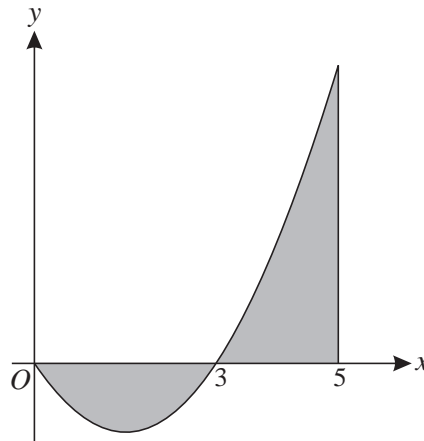
5 The gradient of a curve is given by  $\frac{dy}{dx} = 12\sqrt{x}$ . The curve passes through the point  $(4, 50)$ . Find the equation of the curve. [6]

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  $S_\infty$ .

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]

9 (i)

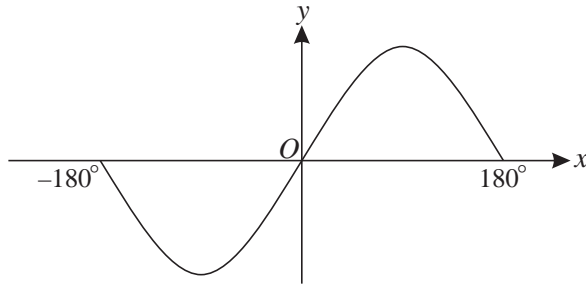


Fig. 1

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)

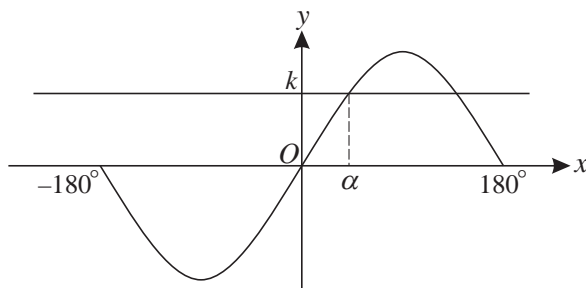


Fig. 2

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  $\alpha$ . State, in terms of  $\alpha$ , 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]

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