Paper Reference(s)

6671

Edexcel GCE

Pure Mathematics P1

Advanced/Advanced Subsidiary

Tuesday 4 November 2003 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination papers	Items included with question
Answer Book (AB16) Mathematical Formulae (Lilac) Graph paper (ASG2)	Nil

Candidates may only use one of the basic scientific calculators approved by the Qualifications and Curriculum Authority.

Instructions to Candidates

In the boxes on the answer book, write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Pure Mathematics P1), the paper reference (6671), your surname, initials and signature.
When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
This paper has eight questions.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner. Answers without working may gain no credit.

1. The sum of an arithmetic series is

$$\sum_{r=1}^{n} (80 - 3r).$$

(*a*) Write down the first two terms of the series. **(2)**

(*b*) Find the common difference of the series. **(1)**

Given that $n = 50$,

(*c*) find the sum of the series. **(3)**

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2. (*a*) Solve the equation $4x^2 + 12x = 0$. **(3)**

$$f(x) = 4x^2 + 12x + c,$$

where c is a constant.

(*b*) Given that $f(x) = 0$ has equal roots, find the value of c and hence solve $f(x) = 0$. **(4)**

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3. Solve the simultaneous equations

$$x - 3y + 1 = 0,$$

$$x^2 - 3xy + y^2 = 11.$$

(7)

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4. (*a*) Expand $(2\sqrt{x} + 3)^2$. **(2)**

(*b*) Hence evaluate $\int_1^2 (2\sqrt{x} + 3)^2 \, dx$, giving your answer in the form $a + b\sqrt{2}$, where a and b are integers. **(5)**

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5. The curve C has equation $y = \cos\left(x + \frac{\pi}{4}\right)$, $0 \le x \le 2\pi$.

(a) Sketch C.

(2)

(b) Write down the exact coordinates of the points at which C meets the coordinate axes.

(3)

(c) Solve, for x in the interval $0 \le x \le 2\pi$,

$$\cos\left(x + \frac{\pi}{4}\right) = 0.5,$$

giving your answers in terms of π.

(4)

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6. A container made from thin metal is in the shape of a right circular cylinder with height h cm and base radius r cm. The container has no lid. When full of water, the container holds 500 cm^3 of water.

(a) Show that the exterior surface area, A cm^2, of the container is given by

$$A = \pi r^2 + \frac{1000}{r}.$$

(4)

(b) Find the value of r for which A is a minimum.

(4)

(c) Prove that this value of r gives a minimum value of A.

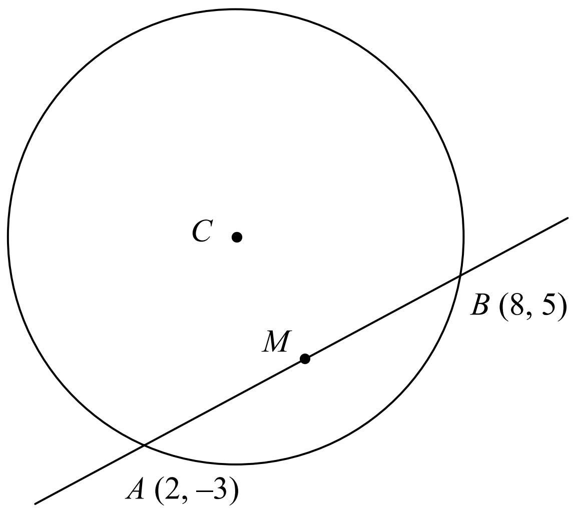
(2)

(d) Calculate the minimum value of A, giving your answer to the nearest integer.

(2)

7.

Figure 1



The points A and B have coordinates $(2, -3)$ and $(8, 5)$ respectively, and AB is a chord of a circle with centre C, as shown in Fig. 1.

(a) Find the gradient of AB.

(2)

The point M is the mid-point of AB.

(b) Find an equation for the line through C and M.

(5)

Given that the x-coordinate of C is 4,

(c) find the y-coordinate of C,

(2)

(d) show that the radius of the circle is $\dfrac{5\sqrt{17}}{4}$.

(4)

8. **Figure 2**

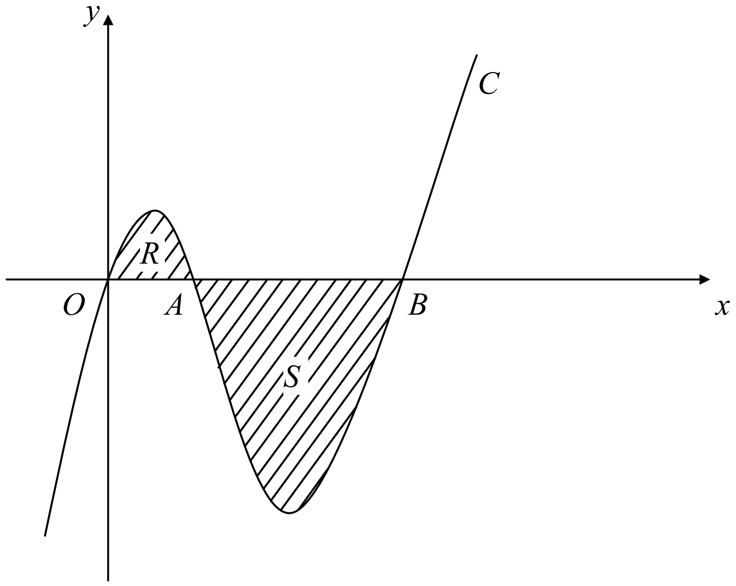


Figure 2 shows part of the curve C with equation $y = f(x)$, where

$$f(x) = x^3 - 6x^2 + 5x.$$

The curve crosses the x-axis at the origin O and at the points A and B.

(*a*) Factorise $f(x)$ completely.

(3)

(*b*) Write down the x-coordinates of the points A and B.

(1)

(*c*) Find the gradient of C at A.

(3)

The region R is bounded by C and the line OA, and the region S is bounded by C and the line AB.

(*d*) Use integration to find the area of the combined regions R and S, shown shaded in Fig. 2.

(7)

END