Paper Reference(s)

6671/01

Edexcel GCE

Pure Mathematics P1

Advanced/Advanced Subsidiary

Monday 23 May 2005 – Morning

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Lilac)	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 8 questions.
The total mark for this paper is 75.

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. Given that $y = 6x - \frac{4}{x^2}$, $x \neq 0$,

(a) find $\frac{\mathrm{d}y}{\mathrm{d}x}$,

(2)

(b) find $\int y \,\mathrm{d}x$.

(3)

2.

$$x^2 - 8x - 29 \equiv (x + a)^2 + b,$$

where a and b are constants.

(a) Find the value of a and the value of b.

(3)

(b) Hence, or otherwise, show that the roots of

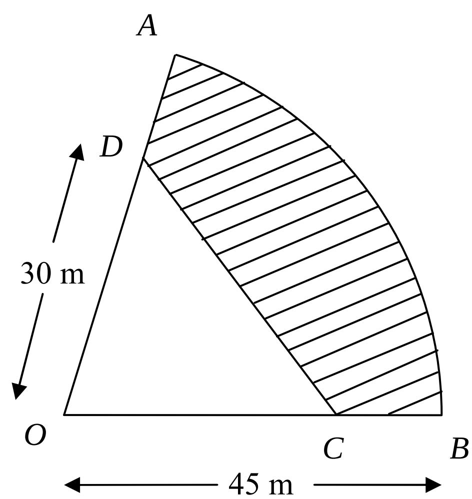
$$x^2 - 8x - 29 = 0$$

are $c \pm d\sqrt{5}$, where c and d are integers to be found.

(3)

---

3. **Figure 1**



A fence from a point A to a point B is in the shape of an arc AB of a circle with centre O and radius 45 m, as shown in Figure 1. The length of the fence is 63 m.

(a) Show that the size of $\angle AOB$ is exactly 1.4 radians.

(2)

The points C and D are on the lines OB and OA respectively, with $OC = OD = 30$ m.

A plot of land $ABCD$, shown shaded in Figure 1, is enclosed by the arc AB and the straight lines BC, CD and DA.

(b) Calculate, to the nearest m^2, the area of this plot of land.

(5)

4. The line l_1 passes through the point (9, –4) and has gradient $\frac{1}{3}$.

(a) Find an equation for l_1 in the form $ax + by + c = 0$, where a, b and c are integers.

(3)

The line l_2 passes through the origin O and has gradient –2. The lines l_1 and l_2 intersect at the point P.

(b) Calculate the coordinates of P.

(4)

Given that l_1 crosses the y-axis at the point C,

(c) calculate the exact area of $\triangle OCP$.

(3)

---

5. Solve, for $-90° < x < 90°$, giving answers to 1 decimal place,

(a) $\tan (3x + 20°) = \dfrac{3}{2}$,

(6)

(b) $2 \sin^2 x + \cos^2 x = \dfrac{10}{9}$.

(4)

---

6. An arithmetic series has first term a and common difference d.

(a) Prove that the sum of the first n terms of the series is

$$\tfrac{1}{2}n[2a + (n - 1)d].$$

(4)

The rth term of a sequence is $(5r - 2)$.

(b) Write down the first, second and third terms of this sequence.

(1)

(c) Show that $$\sum_{r=1}^{n}(5r - 2) = \frac{1}{2}n(5n + 1).$$

(3)

(d) Hence, or otherwise, find the value of $\sum_{r=5}^{200}(5r - 2)$.

(4)

7. **Figure 2**

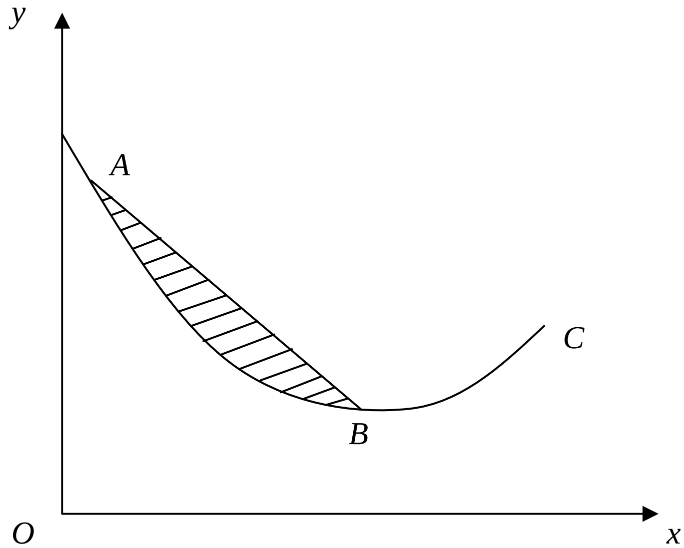


Figure 2 shows part of the curve C with equation

$$y = 2x^{\frac{3}{2}} - 6x + 10, \quad x \geq 0.$$

The curve C passes through the point $A(1, 6)$ and has a minimum turning point at B.

(a) Show that the x-coordinate of B is 4.

(4)

The finite region R, shown shaded in Figure 2, is bounded by C and the straight line AB.

(b) Find the exact area of R.

(8)

8. **Figure 3**

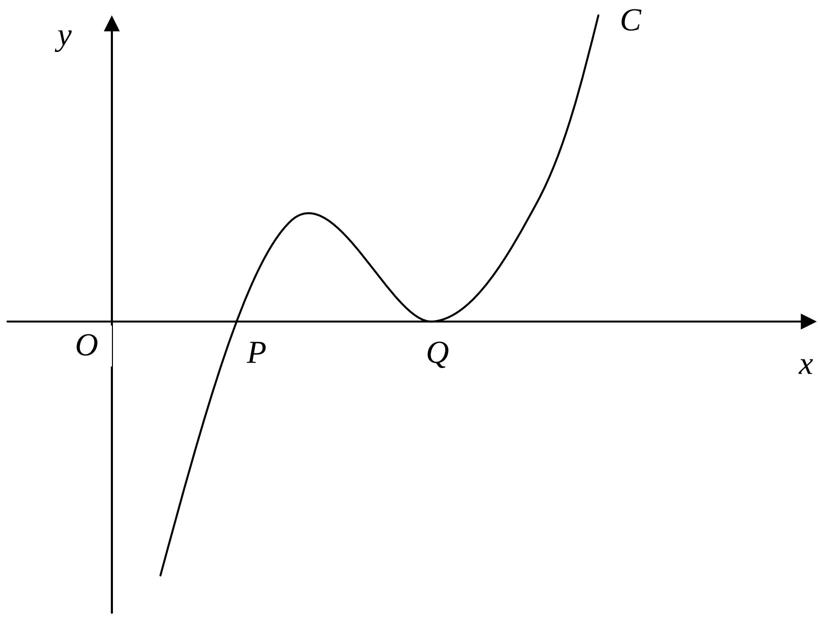


Figure 3 shows part of the curve C with equation $y = \mathrm{f}(x)$, where

$$\mathrm{f}(x) = x^3 - 13x^2 + 55x - 75.$$

The curve crosses the x-axis at the point P and touches the x-axis at the point Q.

(*a*) Show, by using the factor theorem, that $(x - 3)$ is a factor of $\mathrm{f}(x)$.

(2)

(*b*) Factorise $\mathrm{f}(x)$ completely.

(3)

(*c*) Write down the x-coordinate of P and the x-coordinate of Q.

(1)

(*d*) Find the gradient of the tangent to C at the point P.

(3)

Another point S also lies on C. The tangent to C at S is parallel to the tangent to C at P.

(*e*) Find the x-coordinate of S.

(4)

TOTAL FOR PAPER: 75 MARKS

END