Paper Reference(s)

6671

Edexcel GCE

Pure Mathematics P1
Advanced/Advanced Subsidiary
Thursday 8 January 2004 – Afternoon
Time: 1 hour 30 minutes

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

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.
$$f(x) = x^3 - 19x - 30.$$

(*a*) Show that $(x + 2)$ is a factor of f(*x*).

(2)

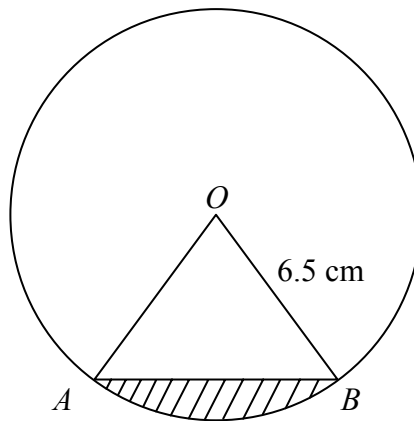(*b*) Factorise f(*x*) completely.

(4)

2.

Figure 1

Figure 1 shows the sector *AOB* of a circle, with centre *O* and radius 6.5 cm, and $\angle AOB = 0.8$ radians.

(*a*) Calculate, in cm², the area of the sector *AOB*.

(2)

(*b*) Show that the length of the chord *AB* is 5.06 cm, to 3 significant figures.

(3)

The segment *R*, shaded in Fig. 1, is enclosed by the arc *AB* and the straight line *AB*.

(*c*) Calculate, in cm, the perimeter of *R*.

(2)

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3. The first three terms of an arithmetic series are p, $5p - 8$, and $3p + 8$ respectively.

(*a*) Show that $p = 4$.

(2)

(*b*) Find the value of the 40th term of this series.

(3)

(*c*) Prove that the sum of the first n terms of the series is a perfect square.

(3)

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4. $$f(x) = x^2 - kx + 9, \text{ where } k \text{ is a constant.}$$

(*a*) Find the set of values of k for which the equation $f(x) = 0$ has no real solutions.

(4)

Given that $k = 4$,

(*b*) express $f(x)$ in the form $(x - p)^2 + q$, where p and q are constants to be found,

(3)

(*c*) write down the minimum value of $f(x)$ and the value of x for which this occurs.

(2)

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5. The curve C with equation $y = f(x)$ is such that

$$\frac{dy}{dx} = 3\sqrt{x} + \frac{12}{\sqrt{x}}, \quad x > 0.$$

(*a*) Show that, when $x = 8$, the exact value of $\frac{dy}{dx}$ is $9\sqrt{2}$.

(3)

The curve C passes through the point (4, 30).

(*b*) Using integration, find $f(x)$.

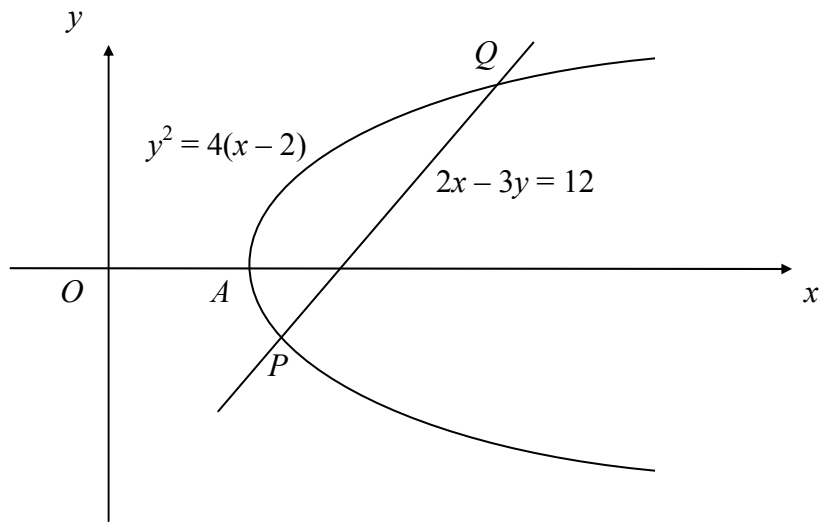**(6)**

6.

Figure 2

Figure 2 shows the curve with equation $y^2 = 4(x - 2)$ and the line with equation $2x - 3y = 12$.

The curve crosses the x-axis at the point A, and the line intersects the curve at the points P and Q.

(*a*) Write down the coordinates of A.

(1)

(*b*) Find, using algebra, the coordinates of P and Q.

(6)

(*c*) Show that $\angle PAQ$ is a right angle.

(4)
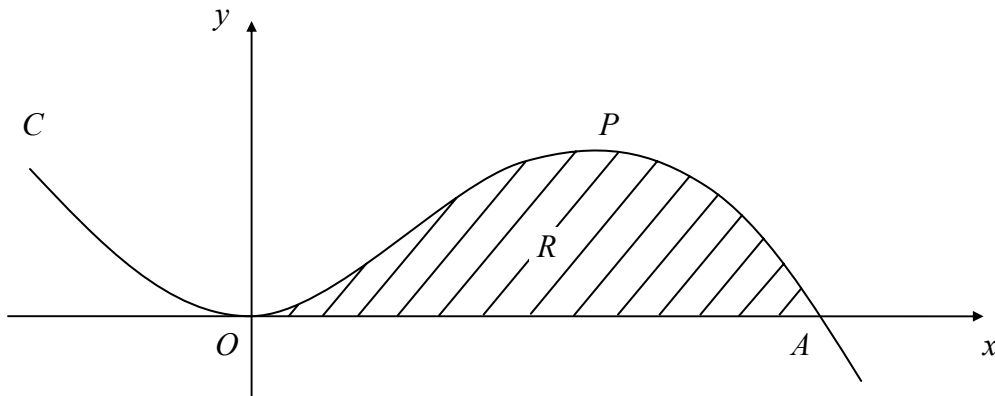
7.

Figure 3

Figure 3 shows part of the curve *C* with equation

$$y = \tfrac{3}{2}x^2 - \tfrac{1}{4}x^3.$$

The curve *C* touches the *x*-axis at the origin and passes through the point *A*(*p*, 0).

(*a*) Show that *p* = 6.

(1)

(*b*) Find an equation of the tangent to *C* at *A*.

(4)

The curve *C* has a maximum at the point *P*.

(*c*) Find the *x*-coordinate of *P*.

(2)

The shaded region *R*, in Fig. 3, is bounded by *C* and the *x*-axis.

(*d*) Find the area of *R*.

(4)

8.   Find all the values of θ in the interval $0 \leq \theta < 360°$ for which

(*a*) $\cos(\theta - 10°) = \cos 15°$,

(3)

(*b*) $\tan 2\theta = 0.4$,

(5)

(*c*) $2 \sin \theta \tan \theta = 3$.

(6)

END