Paper Reference(s)

6663

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Monday 10 January 2005 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Green)	Nil

Calculators may NOT be used in this examination.

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 (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

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 ten 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.

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1. (*a*) Write down the value of $16^{\frac{1}{2}}$.

(1)

(*b*) Find the value of $16^{-\frac{3}{2}}$.

(2)

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2. (i) Given that $y = 5x^3 + 7x + 3$, find

(*a*) $\dfrac{dy}{dx}$,

(3)

(*b*) $\dfrac{d^2y}{dx^2}$.

(1)

(ii) Find $\displaystyle\int \left(1 + 3\sqrt{x} - \frac{1}{x^2}\right) dx$.

(4)

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3. Given that the equation $kx^2 + 12x + k = 0$, where k is a positive constant, has equal roots, find the value of k.

(4)

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4. Solve the simultaneous equations

$$x + y = 2$$

$$x^2 + 2y = 12.$$

(6)

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5. The rth term of an arithmetic series is $(2r - 5)$.

(*a*) Write down the first three terms of this series.

(2)

(*b*) State the value of the common difference.

(1)

(*c*) Show that $\displaystyle\sum_{r=1}^{n} (2r - 5) = n(n - 4)$.

(3)

6.

Figure 1

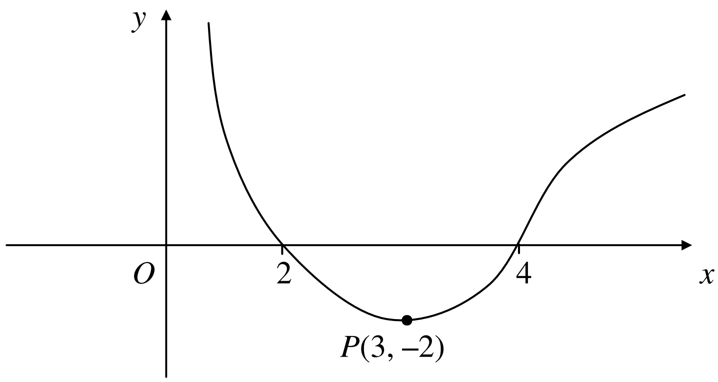

Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve crosses the x-axis at the points (2, 0) and (4, 0). The minimum point on the curve is $P(3, -2)$.

In separate diagrams sketch the curve with equation

(*a*) $y = -f(x)$,

(3)

(*b*) $y = f(2x)$.

(3)

On each diagram, give the coordinates of the points at which the curve crosses the x-axis, and the coordinates of the image of P under the given transformation.

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7. The curve C has equation $y = 4x^2 + \dfrac{5-x}{x}$, $x \neq 0$. The point P on C has x-coordinate 1.

(*a*) Show that the value of $\dfrac{dy}{dx}$ at P is 3.

(5)

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

(3)

This tangent meets the x-axis at the point $(k, 0)$.

(*c*) Find the value of k.

(2)

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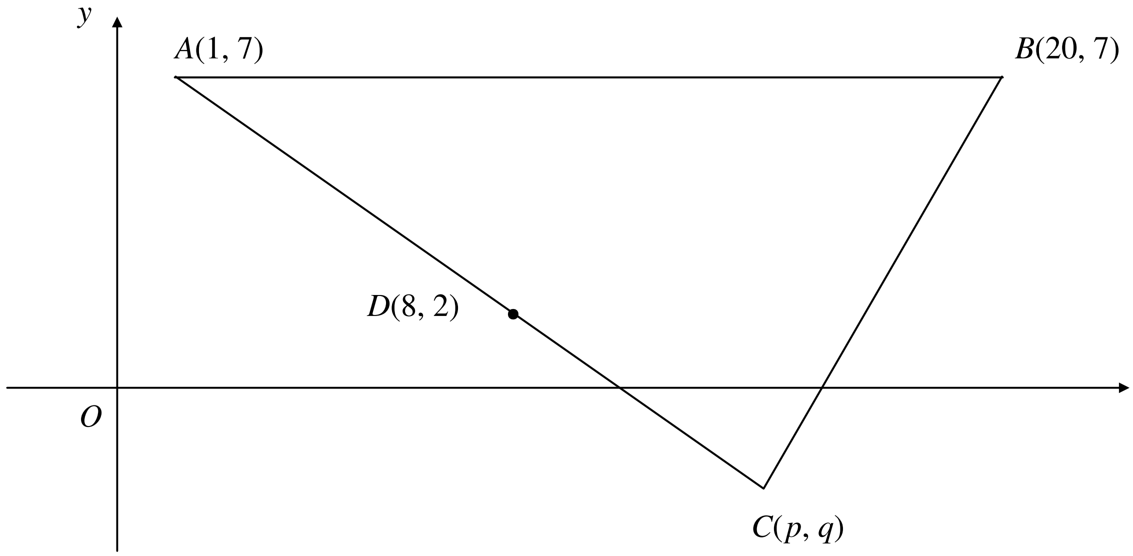
8. **Figure 2**



The points $A(1, 7)$, $B(20, 7)$ and $C(p, q)$ form the vertices of a triangle ABC, as shown in Figure 2. The point $D(8, 2)$ is the mid-point of AC.

(*a*) Find the value of p and the value of q.

(2)

The line l, which passes through D and is perpendicular to AC, intersects AB at E.

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

(5)

(*c*) Find the exact x-coordinate of E.

(2)

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9. The gradient of the curve C is given by

$$\frac{dy}{dx} = (3x - 1)^2.$$

The point $P(1, 4)$ lies on C.

(*a*) Find an equation of the normal to C at P.

(4)

(*b*) Find an equation for the curve C in the form $y = f(x)$.

(5)

(*c*) Using $\frac{dy}{dx} = (3x - 1)^2$, show that there is no point on C at which the tangent is parallel to the line $y = 1 - 2x$.

(2)

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10. Given that

$$f(x) = x^2 - 6x + 18, \quad x \geq 0,$$

(*a*) express f(*x*) in the form $(x - a)^2 + b$, where *a* and *b* are integers.

(3)

The curve *C* with equation $y = f(x)$, $x \geq 0$, meets the *y*-axis at *P* and has a minimum point at *Q*.

(*b*) Sketch the graph of *C*, showing the coordinates of *P* and *Q*.

(4)

The line $y = 41$ meets *C* at the point *R*.

(*c*) Find the *x*-coordinate of *R*, giving your answer in the form $p + q\sqrt{2}$, where *p* and *q* are integers.

(5)

TOTAL FOR PAPER: 75 MARKS

END