Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1
Advanced Subsidiary

Monday 23 May 2005 – Morning
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

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.
There are 10 questions in this question paper. 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 $8^{\frac{1}{3}}$.

(1)

(*b*) Find the value of $8^{-\frac{2}{3}}$.

(2)

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

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

(2)

(*b*) find $\int y \, dx$.

(3)

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

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)

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4. **Figure 1**

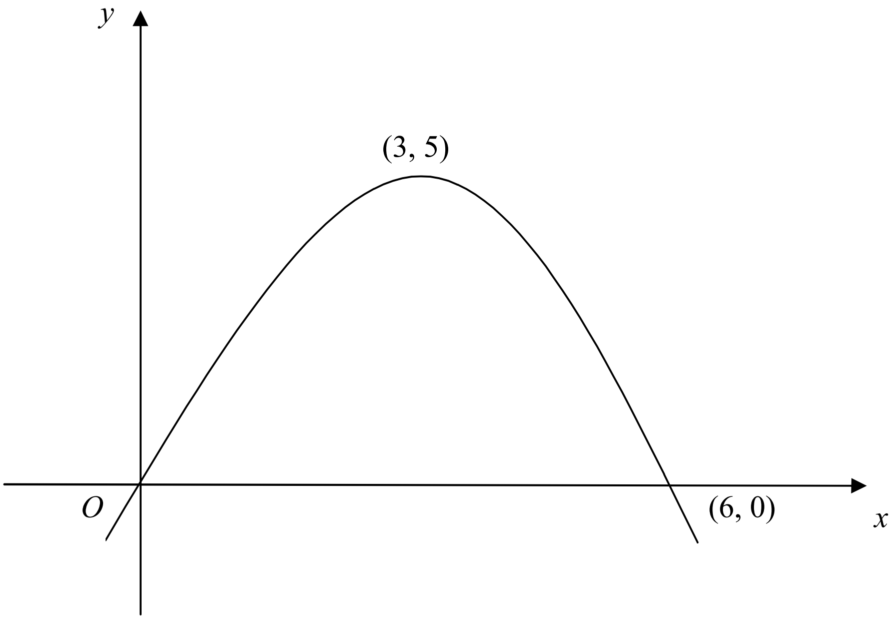

Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve passes through the origin O and through the point (6, 0). The maximum point on the curve is (3, 5).

On separate diagrams, sketch the curve with equation

(*a*) $y = 3f(x)$,

(2)

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

(3)

On each diagram, show clearly the coordinates of the maximum point and of each point at which the curve crosses the x-axis.

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5. Solve the simultaneous equations

$$x - 2y = 1,$$

$$x^2 + y^2 = 29.$$

(6)

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6. Find the set of values of x for which

(*a*) $3(2x + 1) > 5 - 2x$,

(2)

(*b*) $2x^2 - 7x + 3 > 0$,

(4)

(*c*) **both** $3(2x + 1) > 5 - 2x$ **and** $2x^2 - 7x + 3 > 0$.

(2)

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7. (*a*) Show that $\dfrac{(3 - \sqrt{x})^2}{\sqrt{x}}$ can be written as $9x^{-\frac{1}{2}} - 6 + x^{\frac{1}{2}}$.

(2)

Given that $\dfrac{dy}{dx} = \dfrac{(3 - \sqrt{x})^2}{\sqrt{x}}$, $x > 0$, and that $y = \frac{2}{3}$ at $x = 1$,

(*b*) find y in terms of x.

(6)

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8. 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)

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9. 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)

Sean repays a loan over a period of n months. His monthly repayments form an arithmetic sequence.

He repays £149 in the first month, £147 in the second month, £145 in the third month, and so on. He makes his final repayment in the nth month, where $n > 21$.

(*b*) Find the amount Sean repays in the 21st month.

(2)

Over the n months, he repays a total of £5000.

(*c*) Form an equation in n, and show that your equation may be written as

$$n^2 - 150n + 5000 = 0.$$

(3)

(*d*) Solve the equation in part (*c*).

(3)

(*e*) State, with a reason, which of the solutions to the equation in part (*c*) is **not** a sensible solution to the repayment problem.

(1)

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10. The curve C has equation $y = \tfrac{1}{3}x^3 - 4x^2 + 8x + 3$.

The point P has coordinates (3, 0).

(*a*) Show that P lies on C.

(1)

(*b*) Find the equation of the tangent to C at P, giving your answer in the form $y = mx + c$, where m and c are constants.

(5)

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

(*c*) Find the coordinates of Q.

(5)

TOTAL FOR PAPER: 75 MARKS

END