Edexcel GCE
Core Mathematics C4
Silver Level S2
(Question Paper)

**All exam papers are issued free to students for education purpose only.
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Paper Reference(s)

6666/01

Edexcel GCE

Core Mathematics C4

Silver Level S2

Time: 1 hour 30 minutes

Materials required for examination papers
Mathematical Formulae (Green)

Items included with question papers
Nil

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulas stored in them.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C4), the paper reference (6666), 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 8 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.

Suggested grade boundaries for this paper:

A*	A	B	C	D	E
66	58	51	45	39	33

1. $$\frac{9x^2}{(x-1)^2(2x+1)} = \frac{A}{(x-1)} + \frac{B}{(x-1)^2} + \frac{C}{(2x+1)}.$$

Find the values of the constants A, B and C.

(4)

June 2009

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2. (a) Use integration by parts to find $\int x \sin 3x \; \mathrm{d}x$.

(3)

(b) Using your answer to part (a), find $\int x^2 \cos 3x \; \mathrm{d}x$.

(3)

January 2012

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3. A curve C has equation

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

Find the exact value of $\frac{\mathrm{d}y}{\mathrm{d}x}$ at the point on C with coordinates (3, 2).

(7)

June 2010

4.

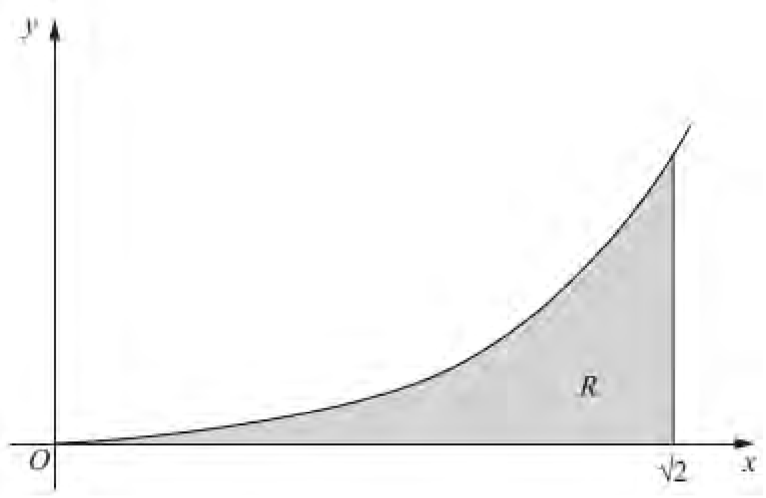

Figure 2

Figure 2 shows a sketch of the curve with equation $y = x^3 \ln (x^2 + 2)$, $x \geq 0$.

The finite region R, shown shaded in Figure 2, is bounded by the curve, the x-axis and the line $x = \sqrt{2}$.

The table below shows corresponding values of x and y for $y = x^3 \ln (x^2 + 2)$.

x	0	$\frac{\sqrt{2}}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{3\sqrt{2}}{4}$	$\sqrt{2}$
y	0		0.3240		3.9210

(a) Complete the table above giving the missing values of y to 4 decimal places.

(2)

(b) Use the trapezium rule, with all the values of y in the completed table, to obtain an estimate for the area of R, giving your answer to 2 decimal places.

(3)

(c) Use the substitution $u = x^2 + 2$ to show that the area of R is

$$\frac{1}{2}\int_2^4 (u-2)\ln u \;\, \mathrm{d}u\,.$$

(4)

(d) Hence, or otherwise, find the exact area of R.

(6)

June 2011

5.

$$\frac{2x^2 + 5x - 10}{(x-1)(x+2)} \equiv A + \frac{B}{x-1} + \frac{C}{x+2}.$$

(*a*) Find the values of the constants *A*, *B* and *C*.

(4)

(*b*) Hence, or otherwise, expand $\frac{2x^2 + 5x - 10}{(x-1)(x+2)}$ in ascending powers of *x*, as far as the term in x^2. Give each coefficient as a simplified fraction.

(7)

June 20108

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6. The area *A* of a circle is increasing at a constant rate of 1.5 $\text{cm}^2\ \text{s}^{-1}$. Find, to 3 significant figures, the rate at which the radius *r* of the circle is increasing when the area of the circle is 2 cm^2.

(5)

January 2010

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7. Relative to a fixed origin *O*, the point *A* has position vector (2**i** – **j** + 5**k**),

the point *B* has position vector (5**i** + 2**j** + 10**k**),

and the point *D* has position vector (–**i** + **j** + 4**k**).

The line *l* passes through the points *A* and *B*.

(*a*) Find the vector $\overrightarrow{AB}$.

(2)

(*b*) Find a vector equation for the line *l*.

(2)

(*c*) Show that the size of the angle *BAD* is 109°, to the nearest degree.

(4)

The points *A*, *B* and *D*, together with a point *C*, are the vertices of the parallelogram *ABCD*, where $\overrightarrow{AB} = \overrightarrow{DC}$.

(*d*) Find the position vector of *C*.

(2)

(*e*) Find the area of the parallelogram *ABCD*, giving your answer to 3 significant figures.

(3)

(*f*) Find the shortest distance from the point *D* to the line *l*, giving your answer to 3 significant figures.

(2)

January 2012

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8. In an experiment testing solid rocket fuel, some fuel is burned and the waste products are collected. Throughout the experiment the sum of the masses of the unburned fuel and waste products remains constant.

Let x be the mass of waste products, in kg, at time t minutes after the start of the experiment. It is known that at time t minutes, the rate of increase of the mass of waste products, in kg per minute, is k times the mass of unburned fuel remaining, where k is a positive constant.

The differential equation connecting x and t may be written in the form

$$\frac{\mathrm{d}x}{\mathrm{d}t} = k(M - x), \text{ where } M \text{ is a constant.}$$

(*a*) Explain, in the context of the problem, what $\frac{\mathrm{d}x}{\mathrm{d}t}$ and M represent.

(2)

Given that initially the mass of waste products is zero,

(*b*) solve the differential equation, expressing x in terms of k, M and t.

(6)

Given also that $x = \frac{1}{2}M$ when $t = \ln 4$,

(*c*) find the value of x when $t = \ln 9$, expressing x in terms of M, in its simplest form.

(4)

June 2013 (R)

TOTAL FOR PAPER: 75 MARKS

END