Centre No.			Paper Reference			Surname	Initial(s)				
Candidate No.			6	6	6	6	/	0	1	Signature	

Paper Reference(s)

6666/01

Edexcel GCE

Core Mathematics C4 Advanced Level

Tuesday 28 June 2005 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination	Items included with question paper	rs
Mathematical Formulae (Green)	Nil	

Candidates may use any calculator EXCEPT those with the facility for symbolic algebra, differentiation and/or integration. Thus candidates may NOT use calculators such as the Texas Instruments TI 89, TI 92, Casio CFX 9970G, Hewlett Packard HP 48G.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.

Check that you have the correct question paper.

You must write your answer for each question in the space following the question.

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.

The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2).

There are 8 questions in this question paper. The total mark for this paper is 75.

There are 24 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.

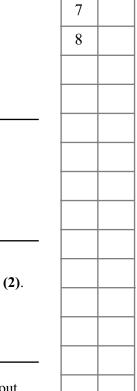
You must show sufficient working to make your methods clear to the Examiner. Answers without working may gain no credit.

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Examiner's use only

Team Leader's use only

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6

Turn over



ose the dinomial	theorem to expand		
	$\sqrt{(4-9x)}$,	$ x < \frac{4}{9},$	
in ascending pow	vers of x, up to and incl	uding the term in x^3 , simplify	ring each term. (5)

(Total 5 marks)

$x^2 + 2xy - 3y^2 + 16 = 0.$	
Find the coordinates of the points on the curve where $\frac{dy}{dx} = 0$.	
dx	(7)
	()

(Total 7 marks)

	1
Leave	
blank	

(b) Hence find the exact value of $\int_2^6 \frac{5x+3}{(2x-3)(x+2)} dx$, giving your answer as a single logarithm. (5)	(a) Express $\frac{5x+3}{(2x-3)(x+2)}$ in partial fractions.	
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		3)
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Question 3 continued		
		Q3
	(Total 8 marks)	

4. Use the substitution $x = \sin \theta$ to find the exact value of	
$\int_0^{\frac{1}{2}} \frac{1}{(1-x^2)^{\frac{3}{2}}} dx.$	
$\int_{0}^{\infty} \frac{1}{(1-x^2)^{\frac{3}{2}}} dx$	
	(7)

Question 4 continued	Leave blank
	Q4
(Total 7 marks)	

5.



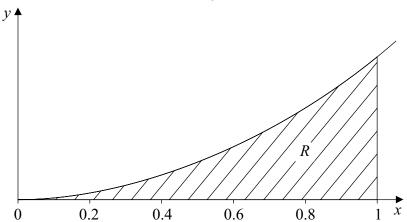


Figure 1 shows the graph of the curve with equation

$$y = xe^{2x}, \qquad x \geqslant 0.$$

The finite region R bounded by the lines x = 1, the x-axis and the curve is shown shaded in Figure 1.

(a) Use integration to find the exact value for the area of R.

(5)

Leave

(b) Complete the table with the values of y corresponding to x = 0.4 and 0.8.

x	0	0.2	0.4	0.6	0.8	1
$y = xe^{2x}$	0	0.29836		1.99207		7.38906

(1)

(c) Use the trapezium rule with all the values in the table to find an approximate value for this area, giving your answer to 4 significant figures.

(4)

	Leave
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Question 5 continued	
	1



Question 5 continued	Leave blank
	05
(Total 10 marks)	Q5

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6. A curve has parametric equations

$$x = 2 \cot t$$
, $y = 2 \sin^2 t$, $0 < t \le \frac{\pi}{2}$.

(a) Find an expression for $\frac{dy}{dx}$ in terms of the parameter t.

(4)

(b) Find an equation of the tangent to the curve at the point where $t = \frac{\pi}{4}$.

(4)

(c) Find a cartesian equation of the curve in the form y = f(x). State the domain on which the curve is defined.

(4)

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Question 6 continued	



Question 6 continued		Lea blai
	(Total 12 marks)	Q

$$\mathbf{r} = \begin{pmatrix} 3 \\ 1 \\ 2 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ -1 \\ 4 \end{pmatrix}$$

and the line l_2 has vector equation

$$\mathbf{r} = \begin{pmatrix} 0 \\ 4 \\ -2 \end{pmatrix} + \mu \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix},$$

where λ and μ are parameters.

The lines l_1 and l_2 intersect at the point B and the acute angle between l_1 and l_2 is θ .

(a) Find the coordinates of B.

(4)

(b) Find the value of $\cos \theta$, giving your answer as a simplified fraction.

(4)

The point A, which lies on l_1 , has position vector $\mathbf{a} = 3\mathbf{i} + \mathbf{j} + 2\mathbf{k}$. The point C, which lies on l_2 , has position vector $\mathbf{c} = 5\mathbf{i} - \mathbf{j} - 2\mathbf{k}$. The point D is such that ABCD is a parallelogram.

(c) Show that $|\overrightarrow{AB}| = |\overrightarrow{BC}|$.

(3)

(d) Find the position vector of the point D.

(2)

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Question 7 continued	



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Question 7 continued	Le bl
	(Total 13 marks)

- **8.** Liquid is pouring into a container at a constant rate of 20 cm³ s⁻¹ and is leaking out at a rate proportional to the volume of liquid already in the container.
 - (a) Explain why, at time t seconds, the volume, $V \, \text{cm}^3$, of liquid in the container satisfies the differential equation

$$\frac{\mathrm{d}V}{\mathrm{d}t} = 20 - kV,$$

where k is a positive constant.

(2)

The container is initially empty.

(b) By solving the differential equation, show that

$$V = A + Be^{-kt},$$

giving the values of A and B in terms of k.

(6)

Given also that $\frac{\mathrm{d}V}{\mathrm{d}t} = 10$ when t = 5,

(c) find the volume of liquid in the container at 10 s after the start.

(5)

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Question 8 continued	



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		(Total 13 marks)	
END	TOTAL FOR I	PAPER: 75 MARKS	





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