Centre No.					Pape	er Refer	ence			Surname	Initial(s)
Candidate No.			6	6	6	5	/	0	1	Signature	

Paper Reference(s)

### 6665/01

## **Edexcel GCE**

# **Core Mathematics C3 Advanced Level**

Thursday 18 January 2007 – Afternoon

Time: 1 hour 30 minutes

Materials required for exam	ination
Mathematical Formulae (Gree	n)

CFX 9970G, Hewlett Packard HP 48G.

Items included with question papers

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

Instri	ictions	to	Can	dida	to

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

Question Number

2

3

4

5

6

7

8

Turn over

Total



(a) By writing $\sin 3\theta$ as $\sin (2\theta + \theta)$ , show that	
$\sin 3\theta = 3\sin \theta - 4\sin^3 \theta.$	(5)
	(5)
(b) Given that $\sin \theta = \frac{\sqrt{3}}{4}$ , find the exact value of $\sin 3\theta$ .	
4	(2)

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Question 1 continued	Olalik
	Q1
(Total 7 marks)	



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2.

$$f(x) = 1 - \frac{3}{x+2} + \frac{3}{(x+2)^2}, \ x \neq -2.$$

(a) Show that 
$$f(x) = \frac{x^2 + x + 1}{(x+2)^2}, x \neq -2.$$

**(4)** 

(b) Show that  $x^2 + x + 1 > 0$  for all values of x.

**(3)** 

(c) Show that f(x) > 0 for all values of  $x, x \neq -2$ .

(1)

Question 2 continued		Lea bla
		Q2
	(Total 8 marks)	



5

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<b>3.</b>	The curve	C has	equation
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 $x = 2 \sin y.$ (a) Show that the point  $P\left(\sqrt{2}, \frac{\pi}{4}\right)$  lies on C.

**(1)** 

(b) Show that  $\frac{dy}{dx} = \frac{1}{\sqrt{2}}$  at P.

**(4)** 

(c) Find an equation of the normal to C at P. Give your answer in the form y = mx + c, where m and c are exact constants.

**(4)** 



Question 3 continued	Leave blank
(Total 9 marks)	Q3



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4	··\	771	$\alpha_1$	4.
4.	(1)	The curve	C nas	equation

$$y = \frac{x}{9 + x^2}.$$

Use calculus to find the coordinates of the turning points of C.

(6)

(ii) Given that

$$y = (1 + e^{2x})^{\frac{3}{2}},$$

find the value of  $\frac{dy}{dx}$  at  $x = \frac{1}{2} \ln 3$ .

(5)


Question 4 continued	Leave blank



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Question 4 continued	Oldlik

Question 4 continued	Leave blank
Question 4 continued	
	Q4
(Total 11 marks)	
(10tai 11 maiks)	



**5.** 

Figure 1

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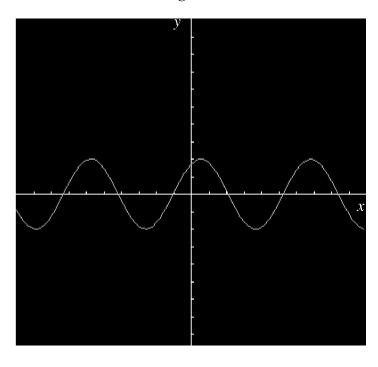


Figure 1 shows an oscilloscope screen.

The curve shown on the screen satisfies the equation

$$y = \sqrt{3}\cos x + \sin x.$$

(a) Express the equation of the curve in the form  $y = R\sin(x + \alpha)$ , where R and  $\alpha$  are constants, R > 0 and  $0 < \alpha < \frac{\pi}{2}$ .

(b) Find the values of x,  $0 \le x < 2\pi$ , for which y = 1.

**(4)** 

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Question 5 continued	
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	-
	Q5
(Total 8 marks)	
(19111 6 11111 119)	-



#### **6.** The function f is defined by

 $f: x \mapsto \ln(4-2x), x < 2 \text{ and } x \in \mathbb{R}.$ 

(a) Show that the inverse function of f is defined by

$$f^{-1}: x \mapsto 2 - \frac{1}{2}e^x$$

and write down the domain of  $f^{-1}$ .

**(4)** 

(b) Write down the range of  $f^{-1}$ .

**(1)** 

(c) In the space provided on page 16, sketch the graph of  $y = f^{-1}(x)$ . State the coordinates of the points of intersection with the x and y axes.

**(4)** 

The graph of y = x + 2 crosses the graph of  $y = f^{-1}(x)$  at x = k.

The iterative formula

$$x_{n+1} = -\frac{1}{2}e^{x_n}, \ x_0 = -0.3$$

is used to find an approximate value for k.

(d) Calculate the values of  $x_1$  and  $x_2$ , giving your answers to 4 decimal places.

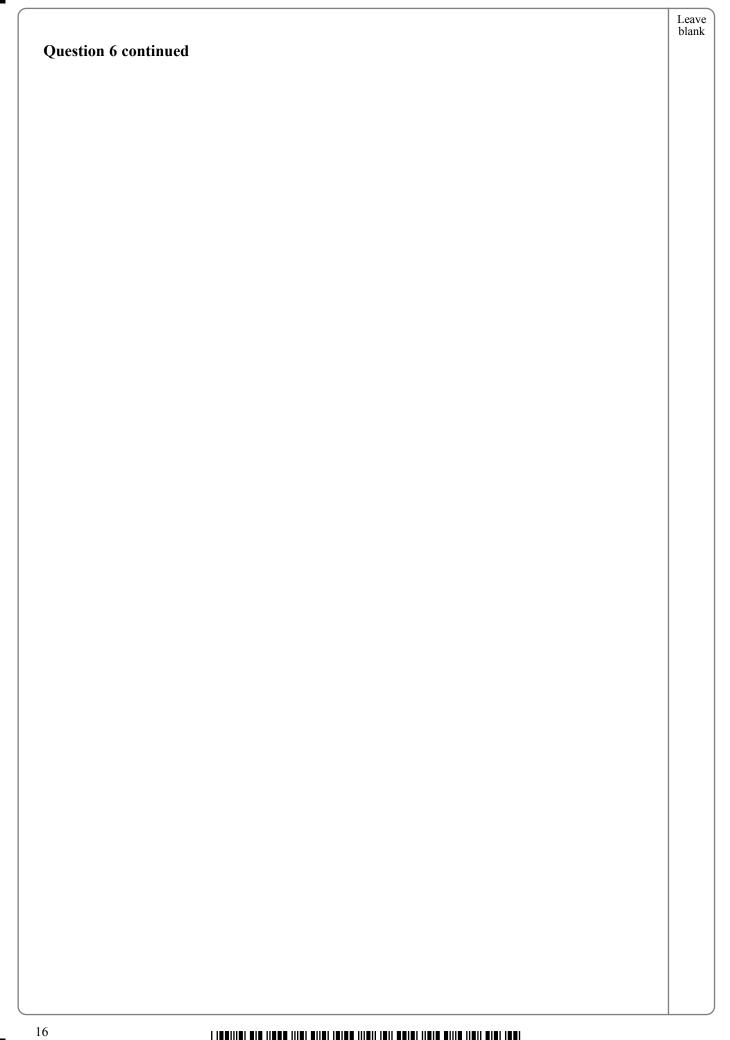
**(2)** 

(e) Find the value of k to 3 decimal places.

**(2)** 

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Question 6 continued	
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Question 6 continued	
	06
	Q6
(Total 13 marks)	

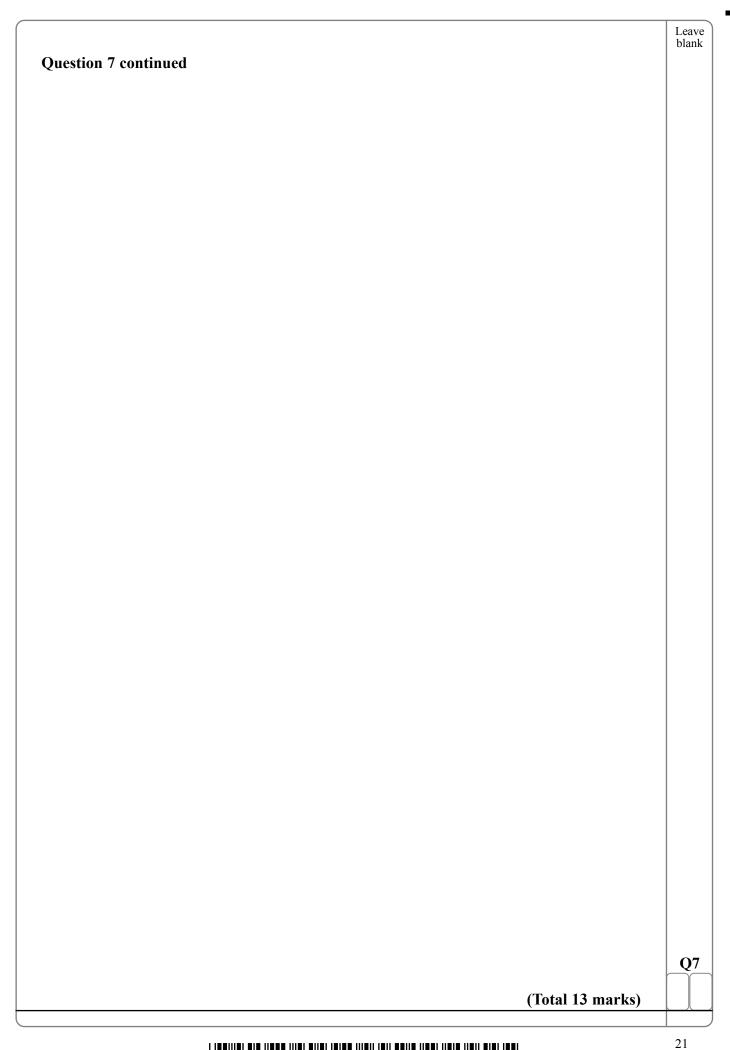
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	$f(x) = x^4 - 4x - 8.$	
(a)	Show that there is a root of $f(x) = 0$ in the interval $[-2, -1]$ .	
		(3)
(b)	Find the coordinates of the turning point on the graph of $y = f(x)$ .	
		(3)
(c)	Given that $f(x) = (x-2)(x^3 + ax^2 + bx + c)$ , find the values of the constants, a, b and	
		(3)
(d)	In the space provided on page 21, sketch the graph of $y = f(x)$ .	<b>(3</b> )
		(3)
(e)	Hence sketch the graph of $y =  f(x) $ .	( <b>4</b> \
		(1)

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Question 7 continued	



Question 7 continued	Leave blank



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8.	(i)	Prove	that
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$$\sec^2 x - \csc^2 x \equiv \tan^2 x - \cot^2 x.$$

**(3)** 

(ii) Given that

$$y = \arccos x$$
,  $-1 \leqslant x \leqslant 1$  and  $0 \leqslant y \leqslant \pi$ ,

(a) express  $\arcsin x$  in terms of y.

**(2)** 

(b) Hence evaluate  $\arccos x + \arcsin x$ . Give your answer in terms of  $\pi$ .

(1)

Question 8 continued	Lea bla



Question 8 continued		Lea bla
		Q8
	(Total 6 marks)	
END	TOTAL FOR PAPER: 75 MARKS	