

Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						<b>6</b>	<b>6</b>	<b>6</b>	<b>5</b>	<b>/</b>	<b>0</b>	<b>1</b>	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 examination

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Mathematical Formulae (Green)

### 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 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

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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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- $$\sin 3\theta = 3\sin \theta - 4\sin^3 \theta.$$

(5)

- (b) Given that  $\sin \theta = \frac{\sqrt{3}}{4}$ , find the exact value of  $\sin 3\theta$ .

(2)



## Q1

104

**(Total 7 marks)**



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**2.**

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

(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)



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**Question 2 continued**

Q2

**(Total 8 marks)**



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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)**



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### Question 3 continued

Q3

**(Total 9 marks)**



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

(6)

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

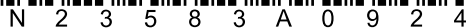
(5)





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**Question 4 continued**





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**Question 4 continued**

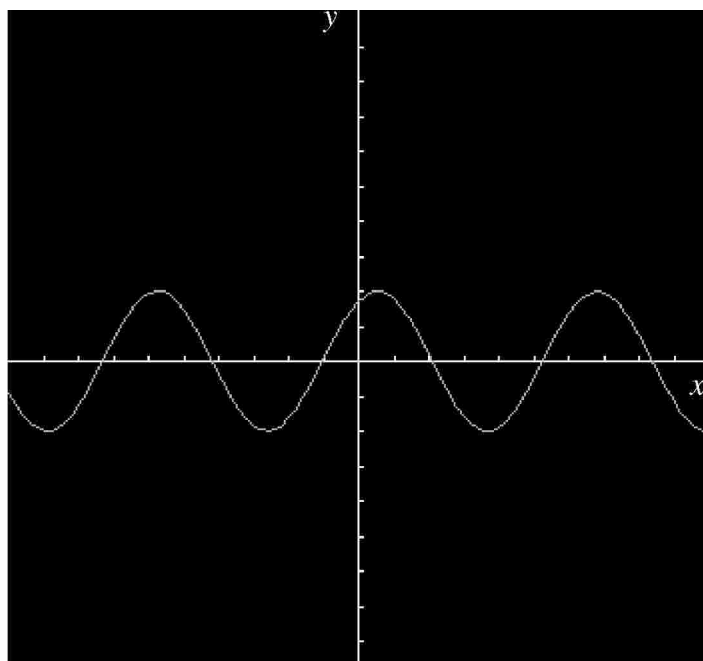
## Q4

**(Total 11 marks)**



**5.**

### Figure 1



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  $0 < \alpha < \frac{\pi}{2}$ . (4)

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

(4)



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**Question 5 continued**

**Q5**

**(Total 8 marks)**



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

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

(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

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

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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$$f(x) = x^4 - 4x - 8.$$

- (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  $c$ .  
(3)
- (d) In the space provided on page 21, sketch the graph of  $y = f(x)$ .  
(3)
- (e) Hence sketch the graph of  $y = |f(x)|$ .  
(1)



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**Question 7 continued**



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Question 7 continued

Lined area for writing the answer to Question 7.



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Question 7 continued

Q7

(Total 13 marks)



**8.** (i) Prove that

(ii) Given that

$$y = \arccos x, \quad -1 \leq x \leq 1 \text{ and } 0 \leq y \leq \pi,$$

(b) Hence evaluate  $\arccos x + \arcsin x$ . Give your answer in terms of  $\pi$ . (1)



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**Question 8 continued**

**Q8**

**(Total 6 marks)**

**TOTAL FOR PAPER: 75 MARKS**

**END**

