

Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	6	6	5	/	0	1	Signature	

Paper Reference(s)

**6665/01**

# Edexcel GCE

## Core Mathematics C3

### Advanced

## Monday 16 June 2014 – Morning

Time: 1 hour 30 minutes

Examiner's use only

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Team Leader's use only

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## Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.

Check that you have the correct question paper.

Answer ALL the questions.

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 9 questions in this question paper. The total mark for this paper is 75.

There are 32 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 should show sufficient working to make your methods clear to the Examiner.

Answers without working may not gain full credit.

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- $$f(x) = \frac{4x + 1}{x - 2}, \quad x > 2$$

- $$f'(x) = \frac{-9}{(x-2)^2}$$

(3)

(b) find the coordinates of  $P$ .

(3)



Q1

**(Total 6 marks)**



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2. Find the exact solutions, in their simplest form, to the equations

(a)  $2 \ln(2x + 1) - 10 = 0$

(2)

(b)  $3^x e^{4x} = e^7$

(4)



Q2

103

**(Total 6 marks)**



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- The point  $P$  has coordinates  $\left(\pi, \frac{\pi}{8}\right)$

- (a) Verify that  $P$  lies on  $C$ .

(1)

- (b) Find the equation of the tangent to  $C$  at  $P$  in the form  $ay = x + b$ , where the constants  $a$  and  $b$  are to be found in terms of  $\pi$ .

(7)



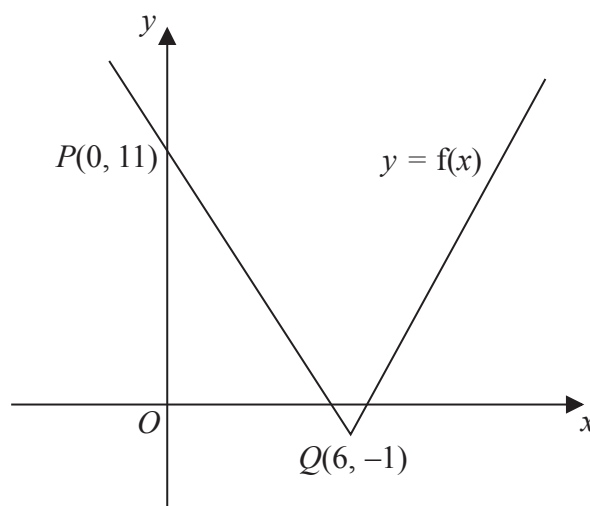
### Q3

1

**(Total 8 marks)**



4.



**Figure 1**

Figure 1 shows part of the graph with equation  $y = f(x)$ ,  $x \in \mathbb{R}$ .

The graph consists of two line segments that meet at the point  $Q(6, -1)$ .

The graph crosses the  $y$ -axis at the point  $P(0, 11)$ .

Sketch, on separate diagrams, the graphs of

(a)  $y = |f(x)|$  (2)

(b)  $y = 2f(-x) + 3$  (3)

On each diagram, show the coordinates of the points corresponding to  $P$  and  $Q$ .

Given that  $f(x) = a|x - b| - 1$ , where  $a$  and  $b$  are constants,

(c) state the value of  $a$  and the value of  $b$ . (2)

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blank**Question 4 continued**

P 4 3 1 6 4 A 0 9 3 2

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Question 4 continued



## Q4

1

**(Total 7 marks)**



5.

$$g(x) = \frac{x}{x+3} + \frac{3(2x+1)}{x^2+x-6}, \quad x > 3$$

- (a) Show that  $g(x) = \frac{x+1}{x-2}$ ,  $x > 3$

(4)

- (b) Find the range of  $g$ .

(2)

- (c) Find the exact value of  $a$  for which  $g(a) = g^{-1}(a)$ .

(4)



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6.

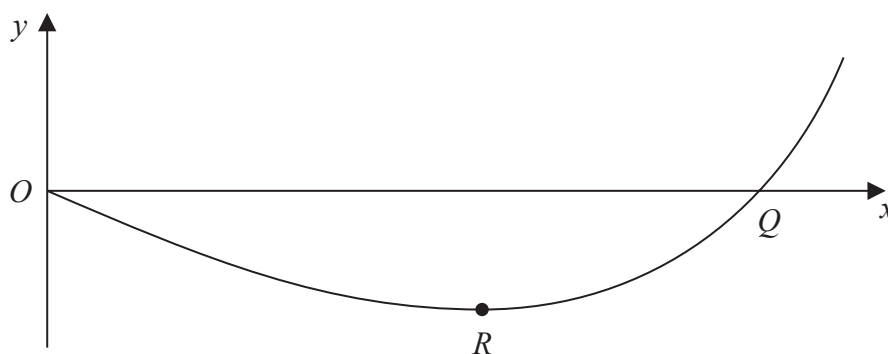


Figure 2

Figure 2 shows a sketch of part of the curve with equation

$$y = 2 \cos\left(\frac{1}{2}x^2\right) + x^3 - 3x - 2$$

The curve crosses the  $x$ -axis at the point  $Q$  and has a minimum turning point at  $R$ .

(a) Show that the  $x$  coordinate of  $Q$  lies between 2.1 and 2.2

(2)

(b) Show that the  $x$  coordinate of  $R$  is a solution of the equation

$$x = \sqrt{1 + \frac{2}{3}x \sin\left(\frac{1}{2}x^2\right)}$$

(4)

Using the iterative formula

$$x_{n+1} = \sqrt{1 + \frac{2}{3}x_n \sin\left(\frac{1}{2}x_n^2\right)}, \quad x_0 = 1.3$$

(c) find the values of  $x_1$  and  $x_2$  to 3 decimal places.

(2)

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Q6

1

**(Total 8 marks)**



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- $$\operatorname{cosec} 2x + \cot 2x = \cot x, \quad x \neq 90n^\circ, \quad n \in \mathbb{Z}$$

(5)

- $$\operatorname{cosec}(4\theta + 10^\circ) + \cot(4\theta + 10^\circ) = \sqrt{3}$$

*(Solutions based entirely on graphical or numerical methods are not acceptable.)*

(5)



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P 4 3 1 6 4 A 0 2 3 3 2

8. A rare species of primrose is being studied. The population,  $P$ , of primroses at time  $t$  years after the study started is modelled by the equation

$$P = \frac{800e^{0.1t}}{1 + 3e^{0.1t}}, \quad t \geq 0, \quad t \in \mathbb{R}$$

- Calculate the number of primroses at the start of the study.  
(2)
- Find the exact value of  $t$  when  $P = 250$ , giving your answer in the form  $a \ln(b)$  where  $a$  and  $b$  are integers.  
(4)
- Find the exact value of  $\frac{dP}{dt}$  when  $t = 10$ . Give your answer in its simplest form.  
(4)
- Explain why the population of primroses can never be 270  
(1)





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[illegible]



9. (a) Express  $2 \sin \theta - 4 \cos \theta$  in the form  $R \sin(\theta - \alpha)$ , where  $R$  and  $\alpha$  are constants,  $R > 0$  and  $0 < \alpha < \frac{\pi}{2}$

(3)

Find

- (b) (i) the maximum value of  $H(\theta)$ ,  
(ii) the smallest value of  $\theta$ , for  $0 \leq \theta < \pi$ , at which this maximum value occurs. (3)

Find

- (c) (i) the minimum value of  $H(\theta)$ ,  
(ii) the largest value of  $\theta$ , for  $0 \leq \theta < \pi$ , at which this minimum value occurs. (3)



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**Q9**

**(Total 9 marks)**

**TOTAL FOR PAPER: 75 MARKS**

**END**

