

**Edexcel GCE**  
**Core Mathematics C3**  
**Silver Level S1**  
**(Question Paper)**

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Paper Reference(s)

**6665/01**

**Edexcel GCE  
Core Mathematics C3  
Silver Level S1**

**Time: 1 hour 30 minutes**

**Materials required for examination papers**

Mathematical Formulae (Green)

**Items included with question**

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**

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Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C3), the paper reference (6665), your surname, initials and signature.

**Information for Candidates**

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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**

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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.

**Suggested grade boundaries for this paper:**

<b>A*</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
<b>72</b>	<b>65</b>	<b>58</b>	<b>51</b>	<b>46</b>	<b>39</b>

1. Differentiate with respect to  $x$ , giving your answer in its simplest form,

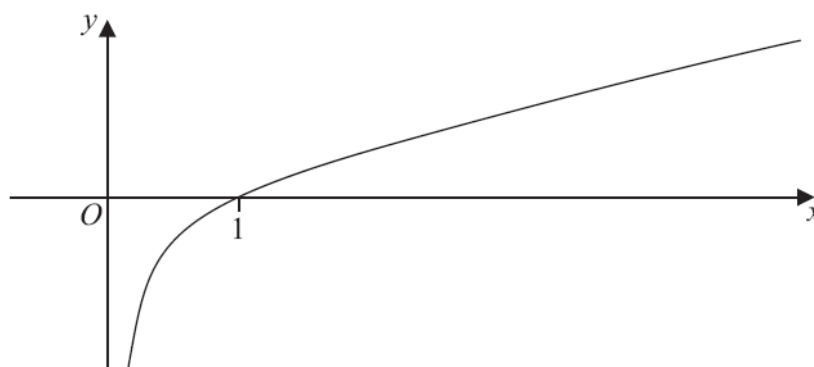
(a)  $x^2 \ln(3x)$ , (4)

(b)  $\frac{\sin 4x}{x^3}$ . (5)

January 2012

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2.



**Figure 1**

Figure 1 shows a sketch of the curve with equation  $y = f(x)$ ,  $x > 0$ , where  $f$  is an increasing function of  $x$ . The curve crosses the  $x$ -axis at the point  $(1, 0)$  and the line  $x = 0$  is an asymptote to the curve.

On separate diagrams, sketch the curve with equation

(a)  $y = f(2x)$ ,  $x > 0$  (2)

(b)  $y = |f(x)|$ ,  $x > 0$  (3)

Indicate clearly on each sketch the coordinates of the point at which the curve crosses or meets the  $x$ -axis.

**June 2013 (R)**

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3. The area,  $A \text{ mm}^2$ , of a bacterial culture growing in milk,  $t$  hours after midday, is given by

$$A = 20e^{1.5t}, \quad t \geq 0.$$

- (a) Write down the area of the culture at midday. (1)
- (b) Find the time at which the area of the culture is twice its area at midday. Give your answer to the nearest minute. (5)

**January 2012**

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4.  $f(x) = -x^3 + 3x^2 - 1.$

- (a) Show that the equation  $f(x) = 0$  can be rewritten as

$$x = \sqrt{\left(\frac{1}{3-x}\right)}.$$

(2)

- (b) Starting with  $x_1 = 0.6$ , use the iteration

$$x_{n+1} = \sqrt{\left(\frac{1}{3-x_n}\right)}$$

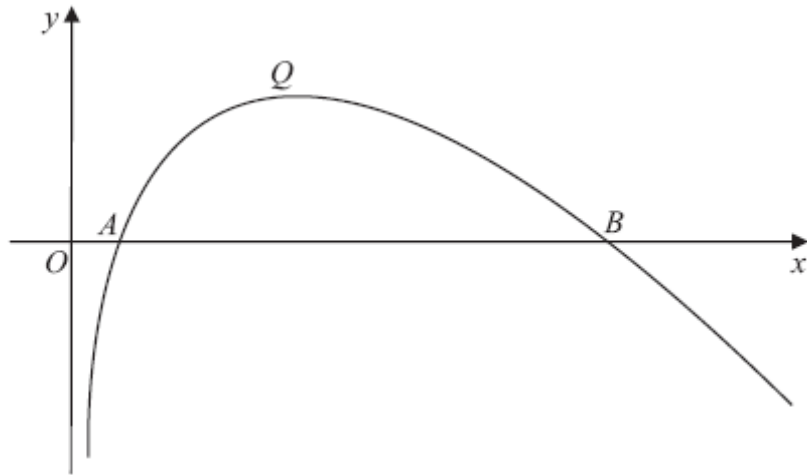
to calculate the values of  $x_2$ ,  $x_3$  and  $x_4$ , giving all your answers to 4 decimal places. (2)

- (c) Show that  $x = 0.653$  is a root of  $f(x) = 0$  correct to 3 decimal places. (3)

**June 2007**

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5.



**Figure 2**

Figure 2 shows a sketch of part of the curve with equation  $y = f(x)$ , where

$$f(x) = (8 - x) \ln x, \quad x > 0.$$

The curve cuts the  $x$ -axis at the points  $A$  and  $B$  and has a maximum turning point at  $Q$ , as shown in Figure 2.

(a) Write down the coordinates of  $A$  and the coordinates of  $B$ . (2)

(b) Find  $f'(x)$ . (3)

(c) Show that the  $x$ -coordinate of  $Q$  lies between 3.5 and 3.6 (2)

(d) Show that the  $x$ -coordinate of  $Q$  is the solution of

$$x = \frac{8}{1 + \ln x}. \quad (3)$$

To find an approximation for the  $x$ -coordinate of  $Q$ , the iteration formula

$$x_{n+1} = \frac{8}{1 + \ln x_n}$$

is used.

(e) Taking  $x_0 = 3.55$ , find the values of  $x_1$ ,  $x_2$  and  $x_3$ .  
Give your answers to 3 decimal places. (3)

**January 2011**

6. (a) Use the identity  $\cos(A + B) = \cos A \cos B - \sin A \sin B$ , to show that

$$\cos 2A = 1 - 2 \sin^2 A \quad (2)$$

The curves  $C_1$  and  $C_2$  have equations

$$C_1: y = 3 \sin 2x$$

$$C_2: y = 4 \sin^2 x - 2 \cos 2x$$

- (b) Show that the  $x$ -coordinates of the points where  $C_1$  and  $C_2$  intersect satisfy the equation

$$4 \cos 2x + 3 \sin 2x = 2 \quad (3)$$

- (c) Express  $4 \cos 2x + 3 \sin 2x$  in the form  $R \cos(2x - \alpha)$ , where  $R > 0$  and  $0 < \alpha < 90^\circ$ , giving the value of  $\alpha$  to 2 decimal places. (3)

- (d) Hence find, for  $0 \leq x < 180^\circ$ , all the solutions of

$$4 \cos 2x + 3 \sin 2x = 2,$$

giving your answers to 1 decimal place.

(4)

**June 2009**

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7. The function  $f$  is defined by

$$f(x) = 1 - \frac{2}{(x+4)} + \frac{x-8}{(x-2)(x+4)}, \quad x \in \mathbb{R}, x \neq -4, x \neq 2.$$

- (a) Show that  $f(x) = \frac{x-3}{x-2}$ . (5)

The function  $g$  is defined by

$$g(x) = \frac{e^x - 3}{e^x - 2}, \quad x \in \mathbb{R}, x \neq \ln 2.$$

- (b) Differentiate  $g(x)$  to show that  $g'(x) = \frac{e^x}{(e^x - 2)^2}$ . (3)

- (c) Find the exact values of  $x$  for which  $g'(x) = 1$

(4)

**June 2009**

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8.

$$f(x) = 3xe^x - 1.$$

The curve with equation  $y = f(x)$  has a turning point  $P$ .

(a) Find the exact coordinates of  $P$ .

(5)

The equation  $f(x) = 0$  has a root between  $x = 0.25$  and  $x = 0.3$ .

(b) Use the iterative formula

$$x_{n+1} = \frac{1}{3}e^{-x_n}.$$

with  $x_0 = 0.25$  to find, to 4 decimal places, the values of  $x_1$ ,  $x_2$  and  $x_3$ .

(3)

(c) By choosing a suitable interval, show that a root of  $f(x) = 0$  is  $x = 0.2576$  correct to 4 decimal places.

(3)

**January 2009**

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**TOTAL FOR PAPER: 75 MARKS**

**END**