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

Paper Reference(s)

6665

Edexcel GCE

Core Mathematics C3

Advanced Level

Mock Paper

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae	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.

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature. You must write your answer for each question in the space following the question. If you need more space to complete your answer to any question, use additional answer sheets.

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.

This paper has eight questions.

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.

Turn over

Leave blank

1. Express

$$\frac{3x^2}{(2x^2+7x+6)} \times \frac{7(3+2x)}{3x^5}$$

as a single fraction in its simplest form.

(4)

Leave blank

2. The function f is defined by

$$f: x \mapsto 2x, \quad x \in \mathbb{R}.$$

(a) Find $f^{-1}(x)$ and state the domain of f^{-1}.

(2)

The function g is defined by

$$g: x \mapsto 3x^2 + 2, \quad x \in \mathbb{R}.$$

(b) Find $gf^{-1}(x)$.

(2)

(c) State the range of $gf^{-1}(x)$.

(1)

Turn over

Leave blank

3. Find the exact solutions of

(i) $e^{2x + 3} = 6$,

(3)

(ii) $\ln(3x + 2) = 4$.

(3)

Leave blank

4. Differentiate with respect to x

(i) $x^3 e^{3x}$,

(3)

(ii) $\dfrac{2x}{\cos x}$,

(3)

(iii) $\tan^2 x$.

(2)

Given that $x = \cos y^2$,

(iv) find $\dfrac{dy}{dx}$ in terms of y.

(4)

Leave blank

5. (a) Using the formulae

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B,$$
$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B,$$

show that

(i) $\sin(A + B) - \sin(A - B) = 2 \cos A \sin B$,

(2)

(ii) $\cos(A - B) - \cos(A + B) = 2 \sin A \sin B$.

(2)

(b) Use the above results to show that

$$\frac{\sin(A+B) - \sin(A-B)}{\cos(A-B) - \cos(A+B)} = \cot A.$$

(3)

Using the result of part (b) and the exact values of sin 60° and cos 60°,

(c) find an exact value for cot 75° in its simplest form.

(4)

Leave blank

6. **Figure 1**

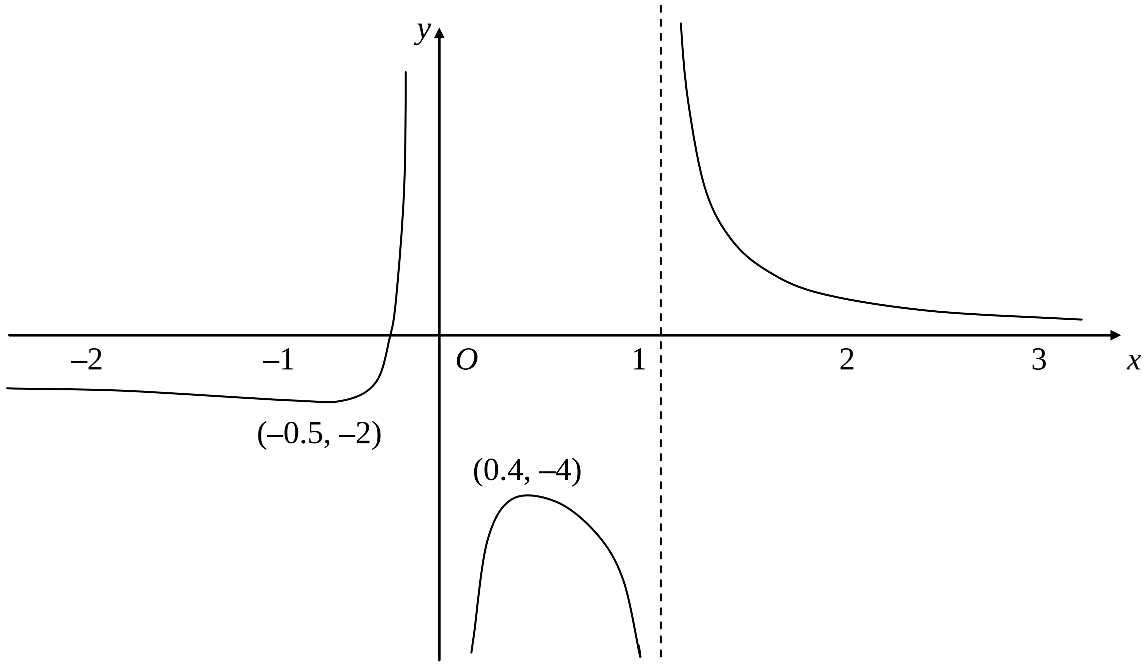

Figure1 shows a sketch of part of the curve with equation $y = \mathrm{f}(x)$, $x \in \mathbb{R}$.

The curve has a minimum point at (–0.5, –2) and a maximum point at (0.4, –4). The lines $x = 1$, the x-axis and the y-axis are asymptotes of the curve, as shown in Fig. 1.

On a separate diagram sketch the graphs of

(a) $y = |\mathrm{f}(x)|$,

(4)

(b) $y = \mathrm{f}(x - 3)$,

(4)

(c) $y = \mathrm{f}(|x|)$.

(4)

In each case show clearly

(i) the coordinates of any points at which the curve has a maximum or minimum point,

(ii) how the curve approaches the asymptotes of the curve.

Leave blank

7. (a) Sketch the curve with equation $y = \ln x$.

(2)

(b) Show that the tangent to the curve with equation $y = \ln x$ at the point (e, 1) passes through the origin.

(3)

(c) Use your sketch to explain why the line $y = mx$ cuts the curve $y = \ln x$ between $x = 1$ and $x = \mathrm{e}$ if $0 < m < \frac{1}{\mathrm{e}}$.

(2)

Taking $x_0 = 1.86$ and using the iteration $x_{n+1} = \mathrm{e}^{\frac{1}{3}x_n}$,

(d) calculate x_1, x_2, x_3, x_4 and x_5, giving your answer to x_5 to 3 decimal places.

(3)

The root of $\ln x - \frac{1}{3}x = 0$ is α.

(e) By considering the change of sign of $\ln x - \frac{1}{3}x$ over a suitable interval, show that your answer for x_5 is an accurate estimate of α, correct to 3 decimal places.

(3)

Leave blank

8. In a particular circuit the current, I amperes, is given by

$$I = 4 \sin \theta - 3 \cos \theta, \quad \theta > 0,$$

where θ is an angle related to the voltage.

Given that $I = R \sin (\theta - \alpha)$, where $R > 0$ and $0 \leqslant \alpha < 360°$,

(a) find the value of R, and the value of α to 1 decimal place.
(4)

(b) Hence solve the equation $4 \sin \theta - 3 \cos \theta = 3$ to find the values of θ between 0 and 360°.
(5)

(c) Write down the greatest value for I.
(1)

(d) Find the value of θ between 0 and 360° at which the greatest value of I occurs.
(2)