Surname	
Other Names	
Candidate Signature	

Centre Number						Candidate Number				

Examiner Comments	

Total Marks

MATHEMATICS

A LEVEL PAPER 2

CM

Bronze Set A (Edexcel Version)

Time allowed: 2 hours

Instructions to candidates:

• In the boxes above, write your centre number, candidate number, your surname, other names and signature.

• Answer ALL of the questions.

• You must write your answer for each question in the spaces provided.

• You may use a calculator.

Information to candidates:

• Full marks may only be obtained for answers to ALL of the questions.

• The marks for individual questions and parts of the questions are shown in round brackets.

• There are 12 questions in this question paper. The total mark for this paper is 100.

Advice to candidates:

• You should ensure your answers to parts of the question are clearly labelled.

• You should show sufficient working to make your workings clear to the Examiner.

• Answers without working may not gain full credit.

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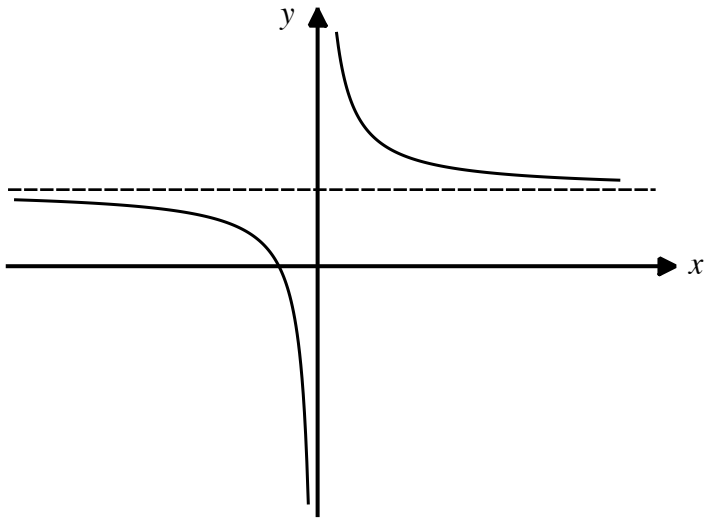

Figure 1

Figure 1 shows a sketch of the curve C with equation $y = \mathrm{f}(x)$, where

$$\mathrm{f}(x) = 2 + x^{-1}$$

The curve C crosses the x-axis at the point A.

(a) Find the coordinates of the point A. **(1)**

(b) Write down the equations of the asymptotes to the curve C. **(2)**

The point B has y-coordinate 4 and lies on the curve C.

(c) Find the distance between the points A and B. **(3)**

(d) In the space on Page 3, sketch the curve with equation $y = \mathrm{f}(x + 3)$.
On your sketch, show clearly the coordinates of any points where the curve crosses the coordinate axes and the equations of any asymptotes. **(4)**

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Question 1 continued

TOTAL 10 MARKS

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2

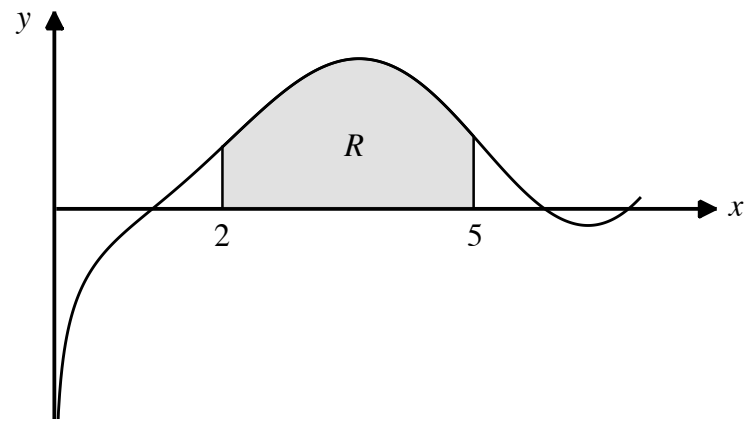

Figure 2

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

$$y = \ln x - \frac{1}{3}x\cos x, \quad x > 0$$

The finite region R, shown shaded in Figure 2, is bounded by the curve C, the x-axis, the line with equation $x = 2$ and the line with equation $x = 5$.

The partially completed table below shows corresponding values of x and y where the values of x are given in radians.

x	2	3	4	5
y	0.9706			

(a) Complete the table above.
Give all your values to 4 decimal places where appropriate. **(2)**

(b) Use the trapezium rule, with all the values of y in the table, to obtain an estimate for the area of the shaded region R. **(3)**

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Question 2 continued

TOTAL 5 MARKS

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3 Show that, for small angles θ measured in radians,

$$\frac{\cos^2\theta}{\sin\theta\tan\theta}$$

can be expressed in the form $A\theta^2 + B\theta^{-2} + C$, where A, B and C are constants to be found. **(3)**

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Question 3 continued

TOTAL 3 MARKS

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4 Find the range of values of x that satisfy both

$$2(x + 3) \geq 4 \quad \textbf{and} \quad 5x^2 + 9x < 2$$

(6)

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Question 4 continued

TOTAL 6 MARKS

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5 The straight line $\mathbf{L}_1$ passes through the points (3, 5) and (7, 10).

(a) Find the equation of the line $\mathbf{L}_1$, giving your answer in the form $y = mx + c$. **(3)**

The straight line $\mathbf{L}_2$ is perpendicular to the line $x = 2y$ and passes through the point (1, 2).

The line $\mathbf{L}_2$ intersects the x-axis at the point A.

(b) Find the coordinates of the point A. **(3)**

The straight line $\mathbf{L}_3$ has the equation $kx - 4y = 10$, where k is a constant, and passes through A.

(c) Determine whether the lines

(i) $\mathbf{L}_1$ and $\mathbf{L}_2$

(ii) $\mathbf{L}_1$ and $\mathbf{L}_3$

(iii) $\mathbf{L}_2$ and $\mathbf{L}_3$

are parallel, perpendicular or neither. **(4)**

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Question 5 continued

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Question 5 continued

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Question 5 continued

TOTAL 10 MARKS

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6 (i) Prove that, for $a > 0$,

$$\frac{\mathrm{d}}{\mathrm{d}x}\left(a^{kx}\right) = ka^{kx}\ln a$$

(3)

(ii) Given that the curve C has the equation

$$x^2 + 3xy - 2y^2 + 5 = 0$$

(a) show that $\dfrac{dy}{dx} = \dfrac{2x+3y}{4y-3x}$, **(4)**

(b) Find the coordinates of the points on C where the gradient of the tangent is 1. **(4)**

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Question 6 continued

TOTAL 11 MARKS

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7 Solve the equation

$$3\cot x + \cot\left(x + \frac{\pi}{4}\right) = 4$$

for $0 \leq x \leq \pi$.

Give your answers to one decimal place. **(5)**

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Question 7 continued

TOTAL 5 MARKS

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8 The positive sequence of numbers $a_1, a_2, a_3, \ldots$ is defined such that

$$a_{n+1} = \frac{1}{2}\left(a_n + \frac{6}{a_n} + 5\right), \quad a_1 = 5, \quad n \geq 1$$

(a) Find the exact value of a_2 and a_3. **(3)**

(b) Find the exact value of $\sum_{n=1}^{3}(a_n - 1)$. **(3)**

(c) (i) Show that

$$a_{n+1} - a_n = -\frac{(a_n - 6)(a_n + 1)}{2a_n}$$

(2)

(ii) Given that $a_n < 6$, determine whether a_n is an increasing sequence, a decreasing sequence or neither. Justify your answer. **(1)**

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Question 8 continued

TOTAL 9 MARKS

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9

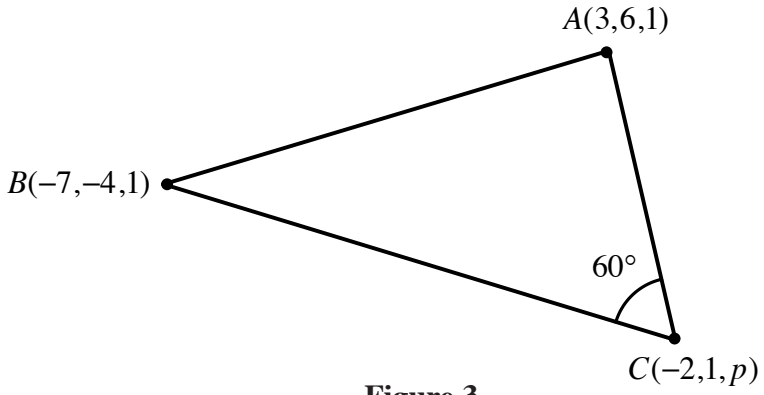

Figure 3

Three points A, B and C form the vertices of the triangle ABC, as shown in Figure 3 above.

The position vector of A is $3\mathbf{i} + 6\mathbf{j} + \mathbf{k}$.

The position vector of B is $-7\mathbf{i} - 4\mathbf{j} + \mathbf{k}$.

The position vector of C is $-2\mathbf{i} + \mathbf{j} + p\mathbf{k}$, where p is a constant.

(a) Find an expression for $\overrightarrow{AB}$, $\overrightarrow{AC}$ and $\overrightarrow{BC}$. **(3)**

(b) Find an expression for $|\overrightarrow{AB}|$, $|\overrightarrow{AC}|$ and $|\overrightarrow{BC}|$. **(3)**

Given that angle $ACB = 60^\circ$,

(c) use the cosine rule, or otherwise, to show that $p^2 - 2p - 149 = 0$. **(3)**

(d) Hence, find the possible values of p. **(1)**

Using the largest possible value of p from (d),

(e) find the exact area of the triangle ABC. **(2)**

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Question 9 continued

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Question 9 continued

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Question 9 continued

TOTAL 12 MARKS

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10 (a) Show that

$$\frac{\cos x - \sin 2x}{1 - 2\cos 2x} \equiv \frac{a\cos x}{b + c\sin x}$$

where a, b and c are integers to be found. **(4)**

(b) Find

$$\int_{\frac{\pi}{3}}^{\frac{\pi}{2}} \frac{\cos x - \sin 2x}{1 - 2\cos 2x}\, dx$$

giving your answer in the form $\ln k$. **(4)**

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Question 10 continued

TOTAL 8 MARKS

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11 The functions f and g have domains $(0, \infty)$ and $(-\infty, -2)$ respectively and are defined such that

$$\mathrm{f}(x) = \sqrt{x^2 + 4}, \qquad \mathrm{g}(x) = \frac{-3}{x+1}$$

(a) Show that g is an increasing function. **(2)**

(b) Write down the range of g. **(2)**

(c) Write down the domain and range of fg. **(2)**

(d) (i) Find an expression for $\mathrm{fg}(x)$.

(ii) Solve the equation $\mathrm{fg}(x) = 3$. **(5)**

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Question 11 continued

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Question 11 continued

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Question 11 continued

TOTAL 11 MARKS

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12 (a) Evaluate

$$\int_0^1 t^2 \, e^{-2t} \, dt$$

Give your answer as an exact values in terms of e. **(5)**

(b) Use the substitution $u = 1 + x$ to find

$$\int x\sqrt{x+1} \, dx$$

(5)

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Question 12 continued

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Question 12 continued

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Question 12 continued

END OF PAPER **TOTAL 10 MARKS**

TOTAL FOR PAPER IS 100 MARKS

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