Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						7	3	6	2	/	0	1	Signature	

Paper Reference(s)

7362/01

London Examinations GCE

Pure Mathematics

Alternative Ordinary Level

Paper 1

Monday 19 January 2009 – Afternoon

Time: 2 hours

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

Materials required for examination	**Items included with question papers**
Nil	Nil

Candidates are expected to have an electronic calculator when answering this paper.

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.
You must write your answer for each question in the space following the question.

Information for Candidates

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 10 questions in this question paper. The total mark for this paper is 100.
There are 28 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

Write your answers neatly and legibly.

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1. In ΔABC, $AB = 6.3\,\text{cm}$, $BC = 4.6\,\text{cm}$ and $\angle BAC = 32°$. Find, to one decimal place, the two possible sizes of $\angle ACB$.

(4)

Q1

(Total 4 marks)

Leave blank

2. Oil is dripping from a leaking pipe and forms a circular pool. Find an estimate of the percentage increase in the radius of the pool when the area has increased by $x\%$, where x is small.

(5)

Q2

(Total 5 marks)

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3. The point A with coordinates (a, b), **where a and b are integers**, lies on the curve C with equation $y = x^3 - 4x^2 - 2x + 10$. The tangent to C at A is parallel to the line with equation $y = x + 7$. Find

(a) the value of a and the value of b,

(5)

(b) an equation for the tangent to C at A.

(1)

Q3

(Total 6 marks)

Leave blank

4. Differentiate, with respect to x,

(a) $y = (4x^3 - 5)\cos 3x$,

(3)

(b) $y = \dfrac{e^{2x}}{3x^2 - x}$.

(3)

Q4

(Total 6 marks)

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5. A curve has equation $y = \dfrac{4-3x}{3x+2}$, $x \neq -\dfrac{2}{3}$

(a) Write down an equation of the asymptote to the curve which is parallel to

(i) the x-axis, (ii) the y-axis.

(2)

(b) Find the coordinates of the point where the curve crosses

(i) the x-axis, (ii) the y-axis.

(2)

Leave blank

Question 5 continued

(c) Sketch the curve, showing clearly on your diagram the asymptotes and the coordinates of the points where the curve crosses the coordinate axes.

(3)

Q5

(Total 7 marks)

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6.

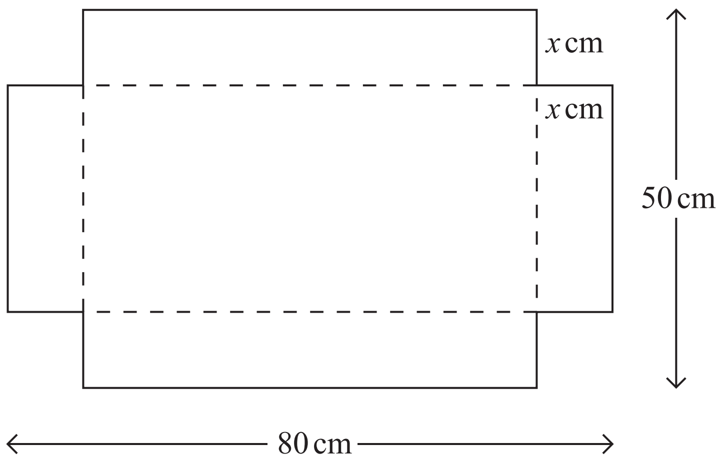

Figure 1

A rectangular sheet of card measures 80 cm by 50 cm. A square of side x cm is cut away from each corner, as shown in Figure 1. The card is folded along the dotted lines to form an open rectangular box of volume V cm^3.

(a) Show that $V = 4000x - 260x^2 + 4x^3$.

(2)

(b) Find the value of x for which V has its maximum value, justifying that this value of x gives the maximum value of V.

(6)

(c) Find the maximum value of V.

(2)

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Question 6 continued

(Total 10 marks)

Q6

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7.

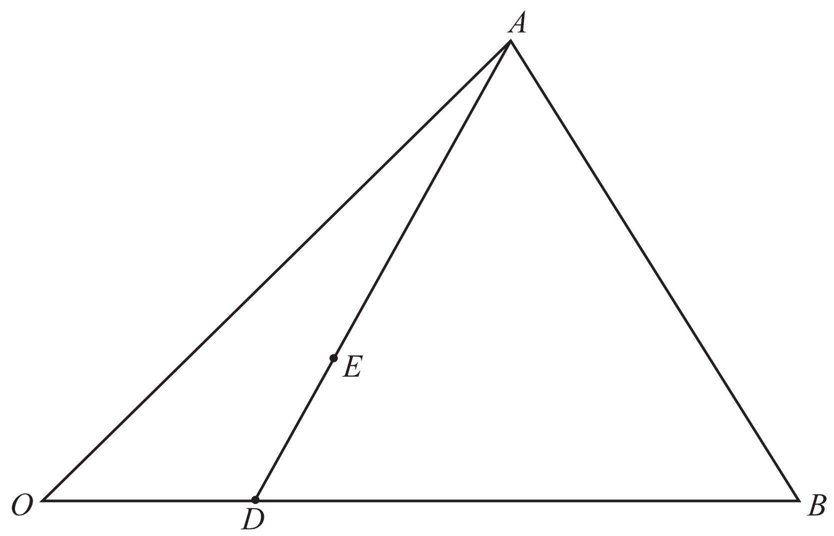

Figure 2

In Figure 2, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$. The point D on OB is such that $OD : OB = 1 : 4$ and the point E divides DA in the ratio 1 : 2

(a) Find, in terms of **a** and **b**,

(i) $\overrightarrow{AD}$, (ii) $\overrightarrow{OE}$, (iii) $\overrightarrow{BE}$.

(4)

The point F lies on OA such that $\overrightarrow{OF} = \mu\overrightarrow{OA}$. Given that F, E and B are collinear,

(b) find the value of μ.

(4)

The point G lies on AB such that $\overrightarrow{AG} = \lambda\overrightarrow{AB}$. Given that EG is parallel to DB,

(c) find the value of λ.

(4)

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Question 7 continued

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Question 7 continued

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Question 7 continued

(Total 12 marks)

Q7

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8. Using $\cos(A+B) \equiv \cos A\cos B - \sin A\sin B$,

(a) show that (i) $\sin^2\theta \equiv \frac{1}{2}(1-\cos 2\theta)$,

(ii) $\cos^2\theta \equiv \frac{1}{2}(\cos 2\theta + 1)$.

(4)

$$\mathrm{f}(\theta) = 8\sin^4\theta - 2\sin^2\theta - 2$$

(b) Show that $\mathrm{f}(\theta) = \cos 4\theta - 3\cos 2\theta$.

(4)

(c) Solve the equation $8\sin^4\theta - 2\sin^2\theta + 3\cos 2\theta = 2.5$ for $0 \leqslant \theta \leqslant \frac{\pi}{2}$, giving your solutions in terms of π.

(4)

(d) Find the exact value of $\int_0^{\frac{\pi}{2}} (4\sin^4\theta - \sin^2\theta + \cos\theta)\,\mathrm{d}\theta$.

(4)

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Question 8 continued

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Question 8 continued

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Question 8 continued

(Total 16 marks)

Q8

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9. The first, third and fifth terms of a geometric series G are $(x-1)$, $3x$ and $(10x+8)$ respectively.

(a) Find the possible values of x.

(4)

Given that all the terms of G are positive, find

(b) the first term of G,

(1)

(c) the common ratio of G.

(2)

The sum of the first n terms of G is S_n.

(d) Find the value of S_8.

(2)

For the same value of x used for G, the first and sixth terms of an arithmetic series A are $(x-1)$ and $(10x+8)$.

(e) Find the common difference of A.

(2)

The sum of the first n terms of A is T_n.

(f) Find the least value of n for which T_n exceeds the value of S_8 found in part (d).

(5)

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Question 9 continued

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Question 9 continued

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Question 9 continued

(Total 16 marks)

Q9

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10. $$\mathrm{f}(x) = x^3 + px^2 - qx - 6, \quad p, q \in \mathbb{Z}$$

Given that $(x-2)$ and $(x+3)$ are factors of f(x),

(a) find the value of p and the value of q.

(4)

(b) Hence, or otherwise, factorise f(x) completely.

(1)

The curve with equation $y = \mathrm{f}(x)$ meets the curve with equation $y = x^3 - 3$ in two points.

(c) Find the coordinates of the two points of intersection.

(4)

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Question 10 continued

Turn over for part (d) and part (e).

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(d) In the space below, sketch, on the same axes,

(i) the curve with equation $y = \mathrm{f}(x)$ showing the coordinates of the points where the curve intersects the coordinate axes,

(ii) the curve with equation $y = x^3 - 3$

(4)

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(e) Find the exact value of the area of the finite region bounded by the curve with equation $y = f(x)$ and the curve with equation $y = x^3 - 3$

(5)

Q10

(Total 18 marks)

TOTAL FOR PAPER: 100 MARKS

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