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 12 May 2008 – 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
Nil

Items included with question papers
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.
If you need more space to complete your answer to any question, use additional answer sheets.

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. The lengths of the sides of a triangle are 4 cm, 5 cm and 6 cm. Find, in degrees to one decimal place, the size of the largest angle of the triangle.

(4)

Q1

(Total 4 marks)

N 3 0 4 5 3 A 0 2 2 8

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2. Find the coordinates of the points of intersection of the curve with equation $y = x^2 - 8x + 11$ and the line with equation $x + y = 5$.

(5)

Q2

(Total 5 marks)

Leave blank

3.

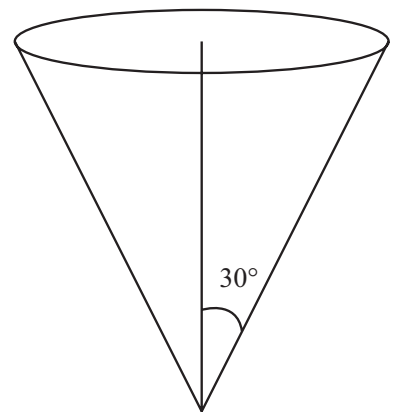

Figure 1

Figure 1 shows a right circular cone which is fixed with its vertex at its lowest point and its axis vertical. The semi-vertical angle of the cone is 30°. The cone is filled with sand. Sand then leaks from the cone through a small hole at the vertex at a constant rate of $5\,\text{cm}^3/\text{s}$. Find, in cm/s to 2 significant figures, the rate of decrease of the radius of the circular surface of the sand when the depth of the sand is 10 cm.

(7)

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Question 3 continued

Q3

(Total 7 marks)

Leave blank

4. Differentiate, with respect to x,

(a) $y = (5x^2 - 2)e^{2x}$,

(3)

(b) $y = \dfrac{x^3 + 2}{x - x^2}$, simplifying your answer.

(4)

N 3 0 4 5 3 A 0 6 2 8

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Question 4 continued

Q4

(Total 7 marks)

Leave blank

5. Referred to a fixed origin O, the position vectors of the points A and B are $4\mathbf{i}+5\mathbf{j}$ and $9\mathbf{i}+15\mathbf{j}$ respectively. The point C divides AB internally in the ratio 2 : 3. Find, in terms of $\mathbf{i}$ and $\mathbf{j}$,

(a) (i) $\overrightarrow{AB}$ (ii) $\overrightarrow{OC}$

(3)

(b) the unit vector in the direction of $\overrightarrow{AB}$.

(2)

The point D lies on BA produced and $\overrightarrow{OD} = \lambda\mathbf{i}$.

(c) Find the value of λ.

(3)

N 3 0 4 5 3 A 0 8 2 8

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Question 5 continued

(Total 8 marks)

Q5

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6. Solve the equation

(a) $\log_p 243 = 5$,

(2)

(b) $\log_4(3q+4) = 3$.

(2)

$$\mathrm{f}(x) = 2x\log_x 3 - 5\log_x 9 - x + 5$$

(c) Find the value of a and the value of b so that $\mathrm{f}(x) = (x-5)(a\log_x 3 - b)$.

(3)

(d) Hence solve the equation $\mathrm{f}(x) = 0$.

(3)

N 3 0 4 5 3 A 0 1 0 2 8

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Question 6 continued

(Total 10 marks)

Q6

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7.

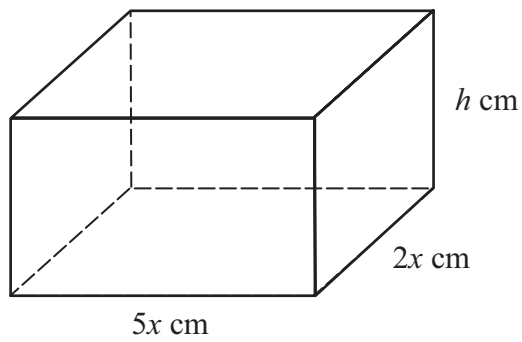

Figure 2

Figure 2 shows a solid cuboid of height h cm. The width of the cuboid is $2x$ cm and the length of the cuboid is $5x$ cm. The total surface area of the cuboid is $A\,\text{cm}^2$.

(a) Write down an expression, in terms of x and h, for A.

(1)

The volume of the cuboid is $500\,\text{cm}^3$.

(b) Show that $A = 20x^2 + \dfrac{700}{x}$.

(3)

(c) Find, to 3 significant figures, the minimum value of A.

(5)

(d) Verify that your answer for part (c) is the minimum value of A.

(2)

N 3 0 4 5 3 A 0 1 2 2 8

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Question 7 continued

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Question 7 continued

Leave blank

Question 7 continued

(Total 11 marks)

Q7

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8. The first three terms of a geometric series are $(15x+6)$, $(6x-3)$ and $(x+4)$ respectively.

(a) Find the possible values of x.

(4)

(b) Find the possible values of the common ratio of the series.

(3)

Given that the series is convergent, find

(c) the sum to infinity of the series,

(3)

(d) the percentage error when the sum of the first n terms is taken as an approximation for the sum to infinity.

(3)

Leave blank

Question 8 continued

(Total 13 marks)

Q8

N 3 0 4 5 3 A 0 1 7 2 8

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9. Using the identities

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

express

(a) $\cos 2A$ in terms of $\cos A$,

(2)

(b) $\sin 2A$ in terms of $\sin A$ and $\cos A$, simplifying your answer.

(1)

(c) Hence show that $\cos 3A \equiv 4\cos^3 A - 3\cos A$.

(4)

(d) Solve, for $0 \leqslant x \leqslant 180°$, the equation $4\cos^3 x - 3\cos x = 0.6$, giving your solutions to one decimal place.

(5)

(e) Evaluate $\int_0^{\frac{\pi}{3}} \cos^3 \theta \, d\theta$, giving your answer in the form $\frac{a}{b}\sqrt{c}$, where a, b and c are integers.

(5)

N 3 0 4 5 3 A 0 1 8 2 8

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Question 9 continued

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Question 9 continued

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Question 9 continued

(Total 17 marks)

Q9

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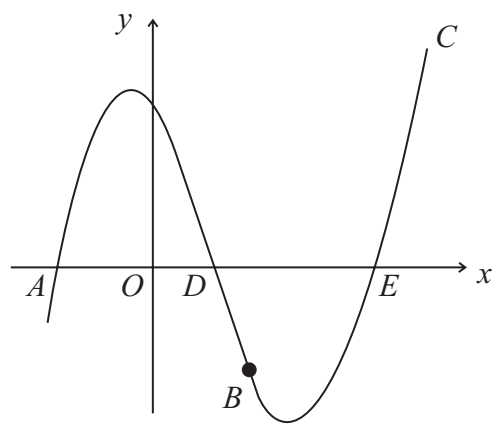

Figure 3

$$f(x) = x^3 + px^2 + qx + 6$$

Figure 3 shows the curve C with equation $y = f(x)$. The point A with coordinates $(-2,0)$ and the point B with coordinates $(2,-4)$ both lie on C.

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

(5)

The curve also intersects the x-axis at the points D and E.

(b) Find the x-coordinate of D and the x-coordinate of E.

(3)

The normal at B intersects the x-axis at the point F.

(c) Find an equation for the normal to the curve C at the point B.

(4)

(d) Find the value of the area enclosed by the curve C, the line BF and the x-axis between the point D and the point F.

(6)

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Question 10 continued

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Question 10 continued

N 3 0 4 5 3 A 0 2 4 2 8

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Question 10 continued

Q10

(Total 18 marks)

TOTAL FOR PAPER: 100 MARKS

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