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

Paper Reference(s)

7362/02

London Examinations GCE

Pure Mathematics

Alternative Ordinary Level

Paper 2

Friday 23 January 2009 – Morning

Time: 2 hours

Materials required for examination
Nil

Items included with question papers
Nil

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

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
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8	
9	
10	
11	
Total	

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 11 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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Turn over

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1. Prove that the line with equation $y = 2x + 12$ is a tangent to the curve with equation $y = 8 - 2x - x^2$.

(4)

Q1

(Total 4 marks)

Leave blank

2. Solve, for $-180° \leqslant \theta < 180°$, $6\sin^2\theta - 7\cos\theta = 1$

(4)

Q2

(Total 4 marks)

Leave blank

3. A particle P moves in a straight line. Initially P is at rest at a fixed point O of the line. At time t seconds after leaving O the velocity, v m/s, of P is given by $v = 3t - t^2$. Find the distance P moves before coming to rest again.

(5)

Q3

(Total 5 marks)

Leave blank

4. (a) Find, in terms of n, $\sum_{r=1}^{n}(5r-2)$.

(3)

(b) Given that $\sum_{r=1}^{n}(5r-2)=648$, find the value of n.

(3)

Q4

(Total 6 marks)

Leave blank

5. (a) On the graph paper draw the lines with equations

(i) $y = 2x - 5$, (ii) $y = -x + 4$, (iii) $y = x$.

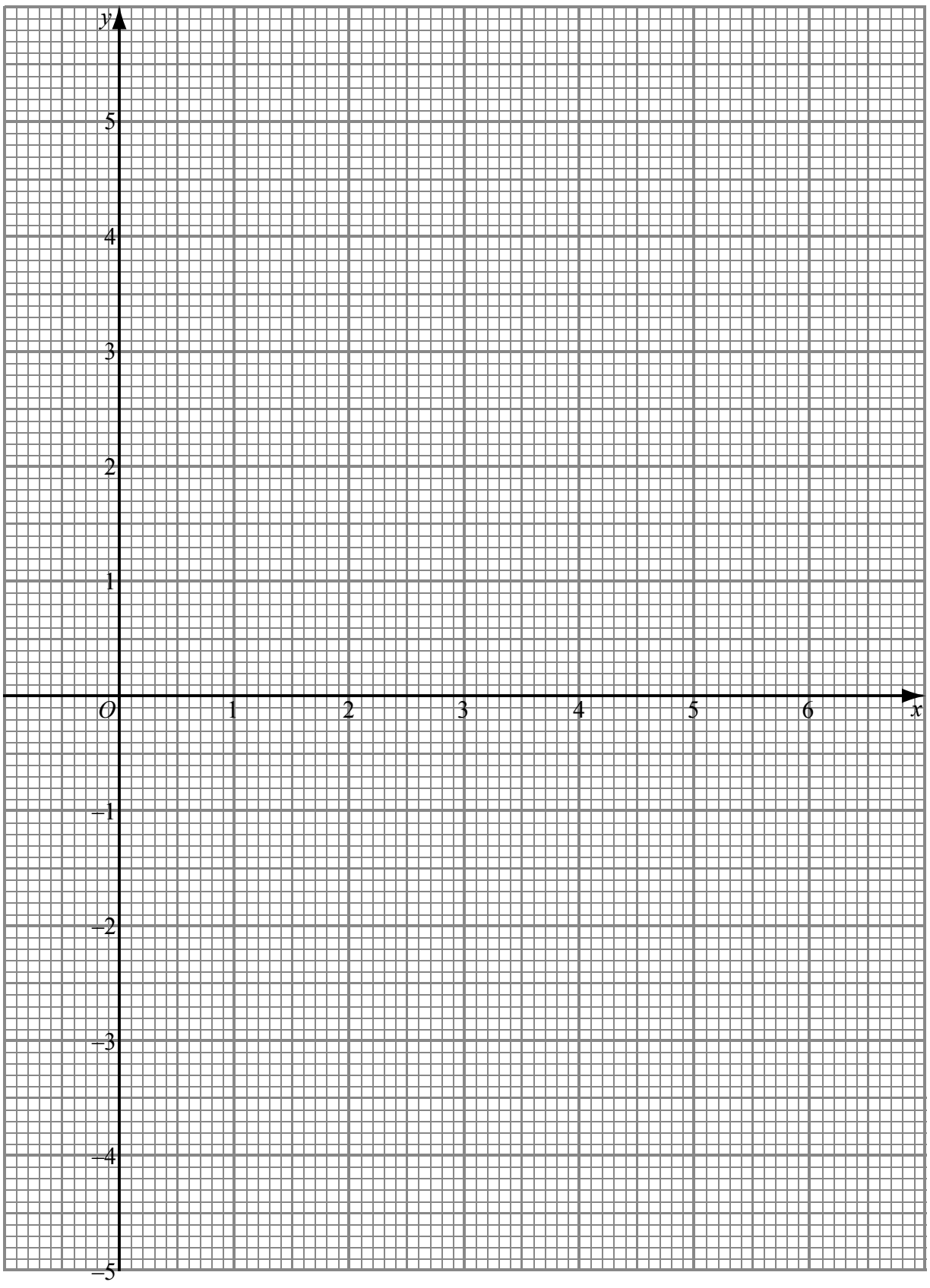
(3)

(b) Show, by shading, the region R for which $y > 2x - 5$, $y > -x + 4$ and $y < x$.

(1)

Leave blank

Question 5 continued



Q5

(Total 4 marks)

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6.

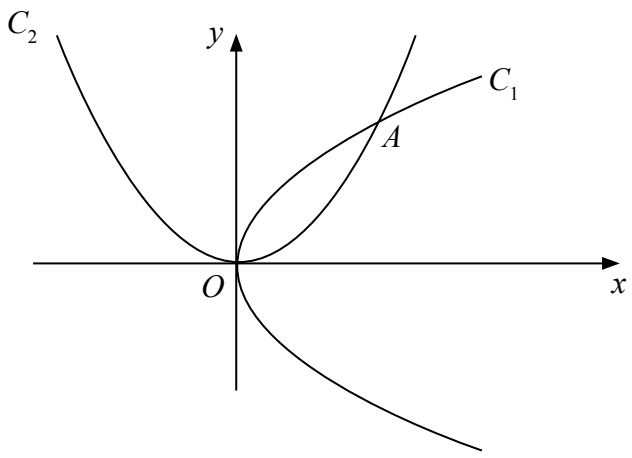

Figure 1

Figure 1 shows the curve C_1 with equation $y^2 = 8x$ and the curve C_2 with equation $y = \frac{1}{8}x^2$. The curves intersect at the origin O and at the point A.

(a) Show that the y-coordinate of A is 8

(2)

(b) Write down the x-coordinate of A.

(1)

The finite region enclosed by C_1 and C_2 is rotated through 360° about the x-axis to generate a solid S.

(c) Find, as a multiple of π, the volume of S.

(5)

Leave blank

Question 6 continued

(Total 8 marks)

Q6

Leave blank

7. $f(x) = x^2 - 7x + 3$

The equation $f(x) = 0$ has roots α and β. Without solving the equation,

(a) find the value of $(\alpha^2 + 1)(\beta^2 + 1)$,

(4)

(b) form an equation with roots $\frac{\alpha}{(\alpha^2 + 1)}$ and $\frac{\beta}{(\beta^2 + 1)}$.

(5)

Question 7 continued

Leave blank

Q7

(Total 9 marks)

Leave blank

8. Solve

(a) $\log_5 p = 4$,

(1)

(b) $2\log_m 8 + 3\log_8 m = 7$

(6)

(c) Solve the equations $5\log_x 16 - 2\log_9 y = 19$

$3\log_x 16 + 4\log_9 y = 14$

(6)

Question 8 continued

Leave blank

(Total 13 marks)

Q8

Leave blank

9. (a) Complete the table for $y = \frac{1}{2}x^3 + x^2 - 4$, giving the values of y to 2 decimal places where appropriate.

x	–2	–1	0	0.5	1	1.5	2	2.5
y	–4		–4		–2.5		4	10.06

(2)

(b) On the graph paper, draw the graph of $y = \frac{1}{2}x^3 + x^2 - 4$ for $-2 \leqslant x \leqslant 2.5$

(2)

(c) Complete the table for $y = 3\ln x + x$, giving the values of y to 2 decimal places.

x	0.15	0.5	0.75	1	1.25	1.5	1.75	2	2.5
y	–5.54		–0.11	1		2.72		4.08	5.25

(2)

(d) Using the same axes as in part (b), draw the graph of $y = 3\ln x + x$ for $0.15 \leqslant x \leqslant 2.5$

(2)

(e) Use your graphs to obtain estimates, to one decimal place, of the solutions of the equation $x^3 + 2x^2 - 2x - 8 = 6\ln x$.

(2)

(f) By drawing a straight line on your graph, estimate, to 2 significant figures, the solution of the equation $x^3 + 2x^2 - x - 4 = 0$

(4)

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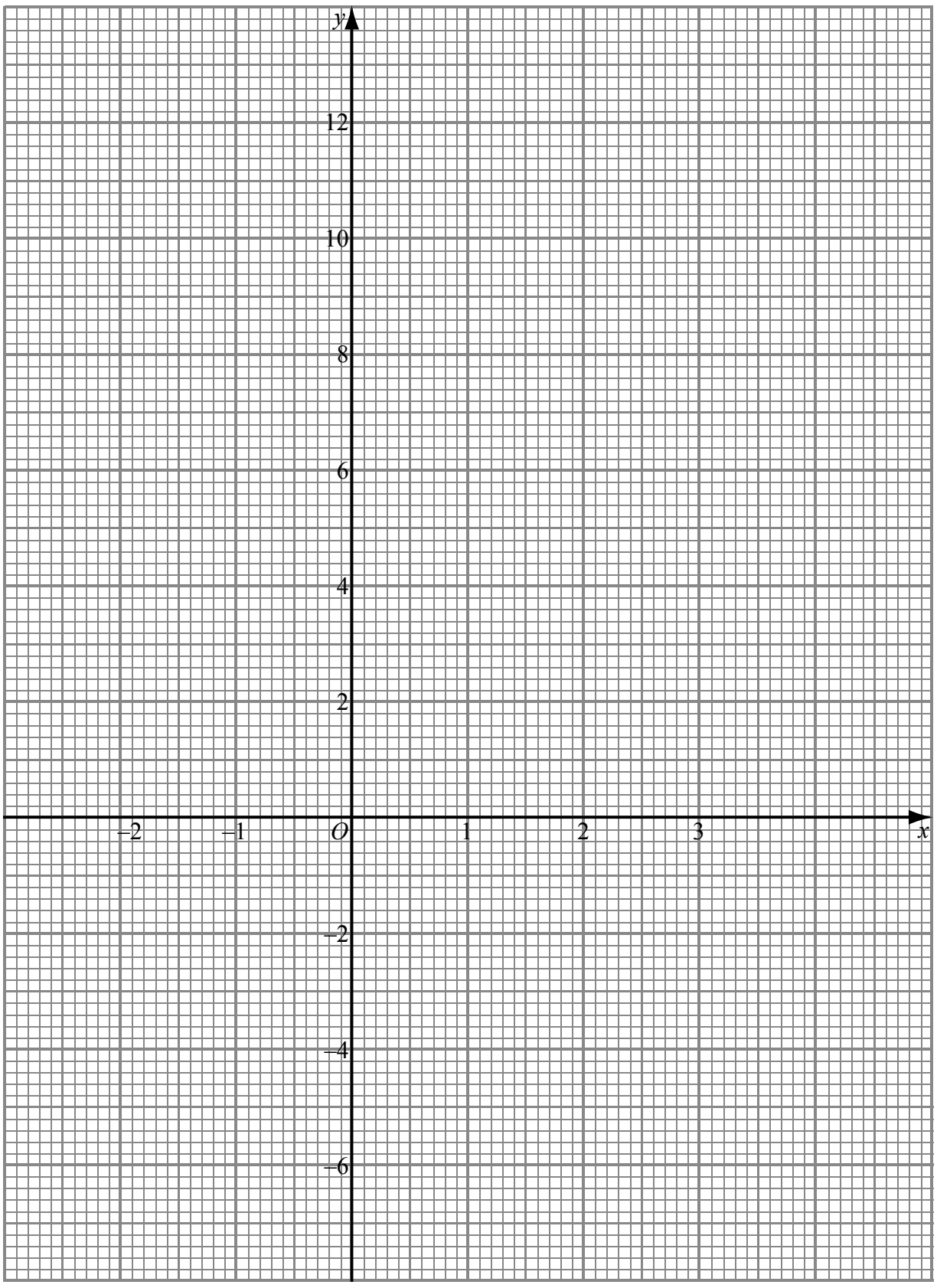
Question 9 continued



Question 9 continued

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Question 9 continued

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(Total 14 marks)

Q9

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10. (a) Expand $(1-6x)^{\frac{1}{3}}$ in ascending powers of x up to and including the term in x^2, simplifying each term.

(3)

(b) By substituting $x = \frac{1}{27}$ into your expansion, obtain an approximation, to 6 significant figures, for $\sqrt[3]{21}$

(4)

(c) Calculate the percentage error, to 2 significant figures, in the approximation obtained in part (b).

(3)

Given that $\frac{(1-6x)^{\frac{1}{3}}}{(1+x)^3} \equiv a + bx + cx^2 + \ldots$

(d) find the values of a, b and c,

(5)

(e) state the range of values for x which the series $a + bx + cx^2 + \ldots$ converges.

(1)

Question 10 continued

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Question 10 continued

Question 10 continued

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(Total 16 marks)

Q10

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11.

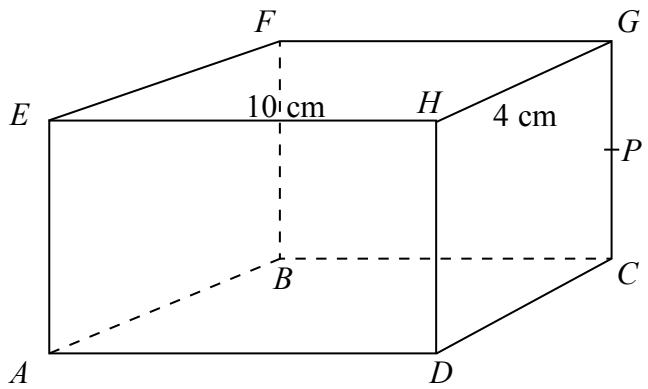

Figure 2

Figure 2 shows a cuboid *ABCDEFGH*. The angle between the diagonal *CE* of the cuboid and the plane *ABCD* is 30°. *EH* = 10 cm and *GH* = 4 cm. The mid-point of *CG* is *P*. Find, in cm to 3 significant figures,

(a) the length of *AE*,

(4)

(b) the length of *CE*,

(3)

(c) the length of *EP*.

(3)

Find, in degrees to 1 decimal place, the size of

(d) the angle between the plane *BCEH* and the plane *EFGH*,

(3)

(e) the angle *EPF*.

(4)

Question 11 continued

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Question 11 continued

Leave blank

Question 11 continued

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Q11

(Total 17 marks)

TOTAL FOR PAPER: 100 MARKS

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