

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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I declare this is my own work.

INTERNATIONAL AS MATHEMATICS

(9660/MA01) Unit P1 Pure Mathematics

Time allowed: 1 hour 30 minutes

Materials

- For this paper you must have the Oxford International AQA Booklet of Formulae and Statistical Tables (enclosed).
- You may use a graphic calculator.

Instructions

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.

Advice

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- Show all necessary working; otherwise marks may be lost.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
TOTAL	



J U N 2 2 M A 0 1 0 1

Answer **all** questions in the spaces provided.

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outside the
box

- 1 (a) The line L has equation

$$ax + 6y = 6$$

where a is a constant.

- 1 (a) (i) Find the value of a for which L passes through the point $(2, -2)$

Circle your answer.

[1 mark]

–9

–3

3

9

- 1 (a) (ii) Find the value of a for which L does not intersect the line with equation $5x + 2y = 6$

Circle your answer.

[1 mark]

–15

–5

5

15



- 4

2 The line J passes through the points $(-2, 1)$ and $(4, 13)$

2 (a) Find the equation of J

Give your answer in the form $y = mx + c$ where m and c are integers.

[3 marks]

$y =$ _____

2 (b) (i) Determine the number of distinct real solutions of the equation

$$3x^2 - 4x + 8 = 2x + 5$$

Justify your answer.

[3 marks]

Answer _____

2 (b) (ii) Describe the relationship between J and the curve with equation

$$y = 3x^2 - 4x + 8$$

[1 mark]



Under this transformation, the point $(2, 3 - \sqrt{7})$ on $y = f(x)$ is mapped to the point $(2, 9 + 5\sqrt{7})$

Full marks will not be awarded for calculator-only working in this question.

[illegible]

5



4 It is given that

$$f(x) = 4x^2 + 12x + 23$$

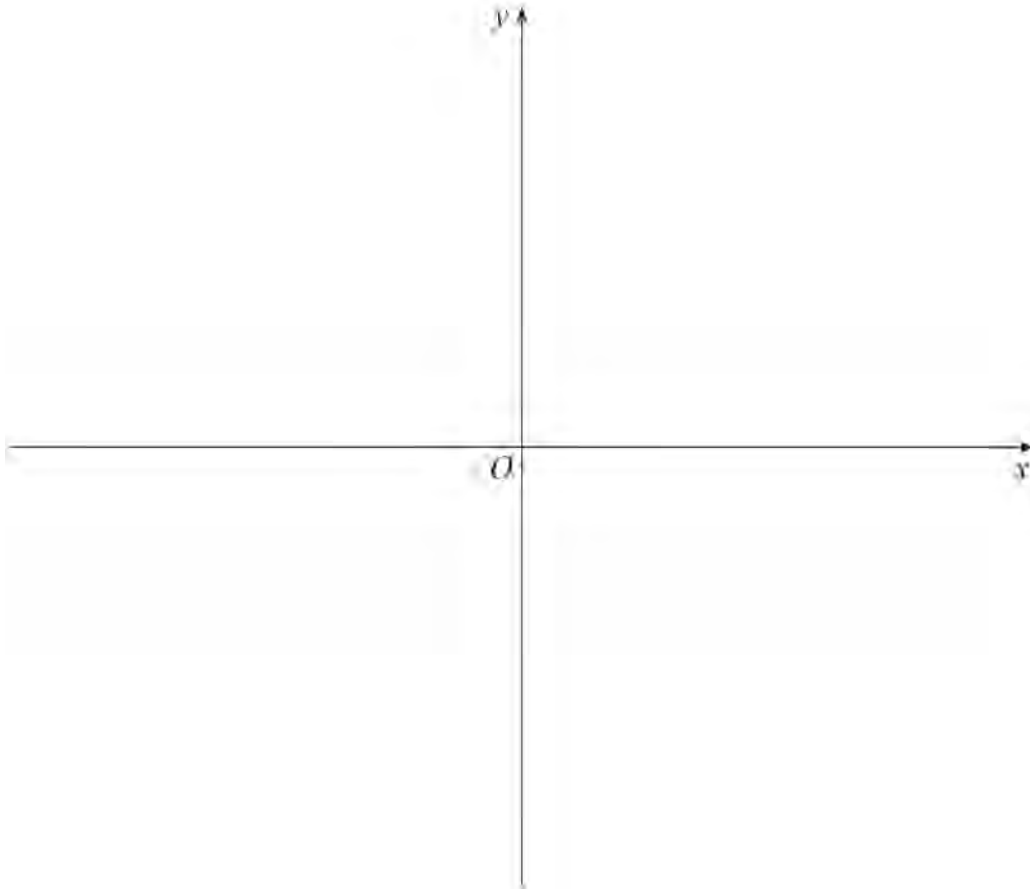
4 (a) Express $f(x)$ in the form $a(x+b)^2 + c$ where a , b and c are constants.

[3 marks]

Answer _____



- 4 (b)** Sketch the curve with equation $y = f(x)$ on the axes below, showing the coordinates of the vertex and the coordinates of any points where the curve crosses the axes.

[3 marks]

- 4 (c)** State the range of values of k for which the equation $f(x) = k$ has no real roots.

[1 mark]

Answer _____

- 4 (d)** Find the shortest distance between the curves with equations $y = f(x)$ and $y = -f(x)$

[1 mark]

Answer _____

Turn over ►

5 The n th term of a sequence is u_n

The sequence is defined by

$$u_{n+1} = k u_n + 15$$

where k is a non-zero constant.

The first term $u_1 = 25$

5 (a) Show that

$$u_3 = 25k^2 + 15k + 15$$

[3 marks]

5 (b) The third term $u_3 = 33$

5 (b) (i) Find the possible values of k

[2 marks]

Answer _____



5 (b) (ii) It is given that the sequence has only positive terms and converges to a limit T

Find the value of T

[2 marks]

$T =$ _____

7

Turn over for the next question

Turn over ►



6

$$p(x) = x^3 + 8x^2 + 14x - 8$$

6 (a)

Show that

$$m^3 - 7m + 6 = 0$$

[4 marks]

[illegible]

[2 marks]

$$m^3 - 7m + 6 = 0$$

[3 marks]

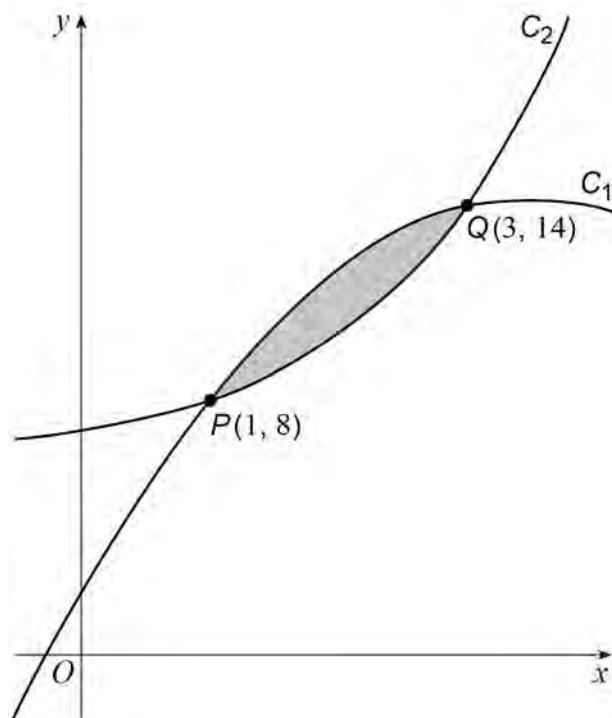
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Answer _____

Turn over ►



- 7 In the diagram below, curves C_1 and C_2 intersect at the points $P(1, 8)$ and $Q(3, 14)$
 The equation of C_1 is $y = 2 + 7x - x^2$
 The equation of C_2 is $y = 6 + 2^x$



7 (a) (i) Find $\int (2 + 7x - x^2) dx$

[2 marks]

Answer

7 (a) (ii) Show that $\int_1^3 (2 + 7x - x^2) dx = 23\frac{1}{3}$

[2 marks]



7 (b)

Give your answer to three decimal places.

[4 marks]

[illegible]

Answer

7 (c) (i)

Give your answer to two decimal places.

[2 marks]

Answer _____

7 (c) (ii)

[2 marks]



8

$$y = 3x^{\frac{2}{3}} \left(x^2 - bx^{\frac{2}{3}} + 4x^{-\frac{2}{3}} \right)$$

where b is a constant, has a stationary point P at $x = 8$

8 (a) Find the value of b

[5 marks]

[illegible]
$$b =$$


- 8 (b) The tangent to the curve at P intersects the y -axis at the point $(0, c)$

Find the value of c

[2 marks]

$c =$ _____

7

Turn over for the next question

Turn over ►



9 The curve C has equation $y = 2x^2 - 10x + 13$

The line L has equation $x + 2y = 5$

9 (a) (i) Show that the y -coordinates of the points of intersection of L and C satisfy the equation

$$8y^2 - 21y + 13 = 0$$

[3 marks]

9 (a) (ii) Hence find the coordinates of the points of intersection of L and C

[3 marks]

Answer _____



[4 marks]

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[2 marks]

$x =$ _____

12



The diagram below shows a pattern consisting of an infinite number of circles whose centres lie on a straight line.

A diagram showing three circles of decreasing size arranged horizontally. The first circle on the left is the largest, followed by a medium-sized circle, and then a smaller circle. To the right of the smallest circle are two small black dots, indicating a sequence continues.

The diameter of the largest circle is the first term.

Find the diameter of the largest circle when the common ratio $r = \frac{3}{5}$ and $S = 20$

[illegible]

Answer



10 (b) (i) Find the values of x for which the common ratio $r = \frac{3}{5}$

10 (b) (ii) Find the range of values of x for which S has a finite value.

[illegible]

END OF QUESTIONS

c



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[illegible]

[illegible]

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2 4



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