

Please write clearly in block capitals.

Centre number

Candidate number

Surname _____

Forename(s) _____

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I declare this is my own work.

INTERNATIONAL AS FURTHER MATHEMATICS

(9665/FM01) Unit FP1 Pure Mathematics

Wednesday 3 January 2024 07:00 GMT Time allowed: 1 hour 30 minutes

Materials

- For this paper you must have the OxfordAQA Booklet of Formulae and Statistical Tables (enclosed).
- You may use a graphical 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	



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

1 (a) (i) It is given that

$$w = (a + 3i)(2 - i)$$

where a is a real constant.

Express w in the form $u + iv$ where u and v are real.

Give your answer in terms of a

[2 marks]

Answer _____

1 (a) (ii) Hence, or otherwise, express the complex number

$$\frac{a + 3i}{2 + i}$$

in the form $x + iy$ where x and y are real.

Give your answer in its simplest form in terms of a

[2 marks]

Answer _____



Answer _____ and _____

6 (b) (ii) Hence find the value of c

[2 marks]

Answer _____

6 (b) (iii) Express α and β in the form $r(\cos\theta + i\sin\theta)$ where $r \geq 0$ and $-\pi < \theta \leq \pi$

[4 marks]

Answer _____ and _____



7 A curve C has equation

$$y = \frac{2}{x^2 - 3}$$

7 (a) Find the equations of the three asymptotes of C

[3 marks]

Asymptote 1 _____

Asymptote 2 _____

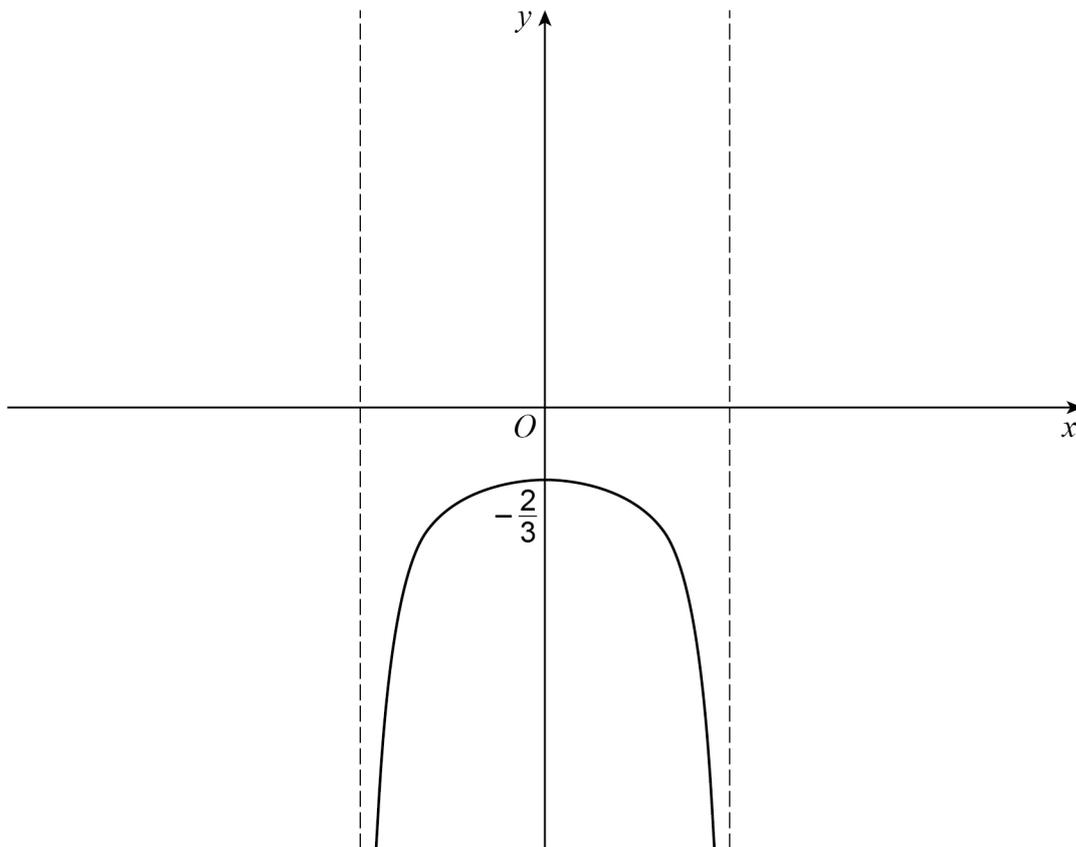
Asymptote 3 _____

7 (b) One section of the graph of C and its vertical asymptotes are shown below.

The y -intercept shown below is the only stationary point of C

On the axes below, complete the sketch of the graph of C

[2 marks]



8 The integral I_n is defined by

$$I_n = \int_0^4 x^n dx$$

where n is a constant.

8 (a) Explain why I_n is an improper integral when $n < 0$

[1 mark]

8 (b) Find the exact value of I_n when $n = -\frac{3}{4}$, showing the limiting process.

[3 marks]

Answer _____



8 (c) Write down a value of n for which I_n does **not** have a finite value.

[1 mark]

$n =$ _____

5

Turn over for the next question

Turn over ►



- 9** The locus of a point P is such that the distance from P to the point $(4, 0)$ is twice the distance from P to the line with equation $x = 1$

The locus of P is the curve C_1

- 9 (a)** Show that the equation of C_1 is

$$\frac{x^2}{m} - \frac{y^2}{n} = 1$$

where m and n are constants.

[4 marks]

- 9 (b)** Write down the equations of the asymptotes of C_1

Give your answers in the form $y = f(x)$

[2 marks]

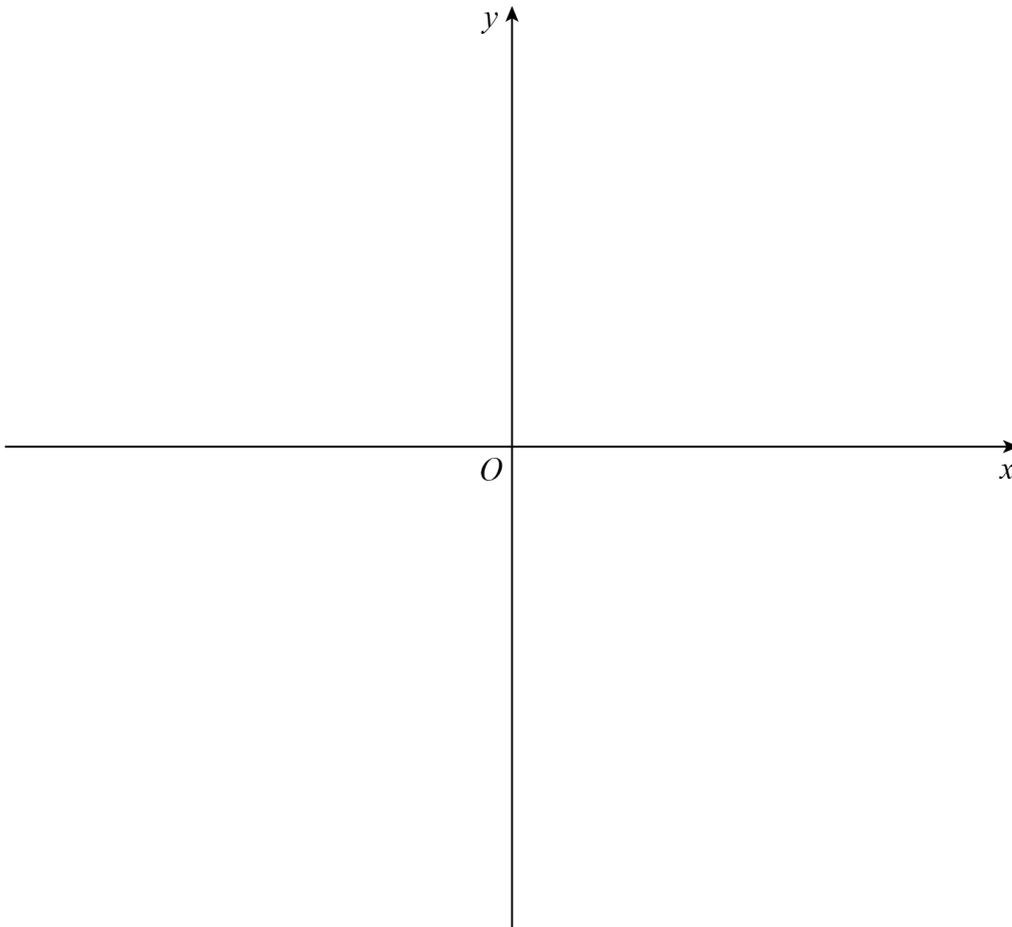
Answer _____



9 (c) Sketch C_1 on the axes below.

Include the asymptotes and label the axis intercepts.

[2 marks]



9 (d) The locus of a point Q is such that the distance from Q to the point $(4, c)$ is twice the distance from Q to the line with equation $x = 1$

The locus of Q is the curve C_2

Write down the equations of the asymptotes of C_2

Give your answer in terms of c

[2 marks]

Answer _____

Turn over ►



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