

Please check the examination details below before entering your candidate information

Candidate surname		Other names	
Centre Number		Candidate Number	

Pearson Edexcel Level 3 GCE

Thursday 22 May 2025

Afternoon (Time: 1 hour 30 minutes) **Paper reference** **9FM0/02**

Further Mathematics

Advanced

PAPER 2: Core Pure Mathematics 2

You must have:
Mathematical Formulae and Statistics Tables (Green), calculator

Total Marks

Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for symbolic algebraic manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 9 questions in this question paper. The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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1. **In this question you must show all stages of your working.**
Solutions relying entirely on calculator technology are not acceptable.

Given that

$$z = 2 - 2\sqrt{3}i \text{ and } w = -1 + \sqrt{3}i$$

show that

$$(a) \quad \left| \frac{z}{w} \right| = \frac{|z|}{|w|} \quad (3)$$

$$(b) \quad \arg(zw) = \arg(z) + \arg(w) \quad (3)$$

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Question 1 continued

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(Total for Question 1 is 6 marks)

Question 2 continued

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Question 2 continued

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Question 2 continued

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Question 3 continued

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Question 3 continued

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Question 3 continued

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Question 4 continued

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Question 4 continued

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Question 4 continued

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(Total for Question 4 is 10 marks)

5. Three planes are defined by the following equations

$$2x - y + z = 3$$

$$x + py - 3z = q$$

$$3x + y - 2z = 4$$

where p and q are constants.

Given that the planes form a sheaf, determine

(i) the value of p

(ii) the value of q

(4)

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Question 5 continued

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(Total for Question 5 is 4 marks)

6. The quartic equation

$$2x^4 + Ax^3 - Ax^2 - 5x + 6 = 0$$

where A is a real constant, has roots α , β , γ and δ

(a) Determine the value of

$$\frac{3}{\alpha} + \frac{3}{\beta} + \frac{3}{\gamma} + \frac{3}{\delta} \quad (3)$$

Given that $\alpha^2 + \beta^2 + \gamma^2 + \delta^2 = -\frac{3}{4}$

(b) determine the possible values of A (5)

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Question 6 continued

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(Total for Question 6 is 8 marks)



7.

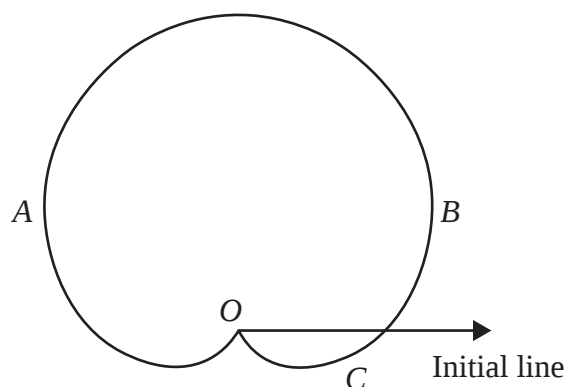


Figure 1

The curve C shown in Figure 1 has polar equation

$$r = a(1 + \sin \theta) \quad -\pi < \theta \leq \pi$$

where a is a constant.

The tangents to C at the points A and B are perpendicular to the initial line.

(a) Use calculus to determine the polar coordinates of A and B

(6)

The curve C models the perimeter of the surface of a swimming pool.

Given that, according to the model, the distance across the pool from A to B is 10 m,

(b) show that $a = \frac{20\sqrt{3}}{9}$

(2)

(c) Use algebraic integration to determine the surface area of the swimming pool, according to the model.

(4)

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Question 7 continued

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Question 7 continued

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Question 8 continued

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Question 9 continued

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Question 9 continued

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(Total for Question 9 is 7 marks)**TOTAL FOR PAPER IS 75 MARKS**