Pearson Edexcel International Advanced Level

Thursday 21 May 2026

Afternoon (Time: 1 hour 30 minutes)

Paper reference **WFM01/01A**

Mathematics

International Advanced Subsidiary/Advanced Level
Further Pure Mathematics F1
Question Paper

You must have:
Answer book (sent separately).
Do not return the question paper with the answer book.

Turn over ▶

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Pearson

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

$$f(z) = 4z^3 - 5z^2 + 14z + 15$$

Given that $1 - 2i$ is a root of the equation $f(z) = 0$, determine the other two roots of the equation $f(z) = 0$

(5)

(Total for Question 1 is 5 marks)

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

The rectangular hyperbola H has parametric equations

$$x = 6t \qquad y = \frac{6}{t} \qquad t \neq 0$$

The line l has equation $x - 3y + 3 = 0$

(a) Determine the coordinates of the points of intersection of H and l

(3)

Given that

- H and l intersect at the point P where $x < 0$
- the tangent to H at P intersects the x-axis at the point Q

(b) determine the x coordinate of Q

(3)

(Total for Question 2 is 6 marks)

3.

$$\mathbf{A} = \begin{pmatrix} 5k & k-3 \\ k+2 & k-1 \end{pmatrix}$$

where k is a constant.

Given that $\det \mathbf{A} = 5$

(a) determine the value of k

(3)

(b) Hence determine $\mathbf{A}^{-1}$, giving your answer in the form $\frac{1}{10}\begin{pmatrix} a & b \\ c & d \end{pmatrix}$

where a, b, c and d are integers to be found.

(2)

The transformation represented by $\mathbf{A}$ transforms the square S onto the square S'

Given that the sides of S have length 1.3

(c) determine the area of S'

(1)

The diagonals of S' intersect at the point $(-8, 6)$

(d) Determine, in simplest form, the coordinates of the point where the diagonals of S intersect.

(2)

(Total for Question 3 is 8 marks)

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

$$\mathrm{f}(x) = \frac{3}{2}x^3 - 6\sqrt{x} + \frac{1}{x} \qquad x > 0$$

(a) Determine $\mathrm{f}'(x)$

(2)

The equation $\mathrm{f}(x) = 0$ has a root α in the interval $[0.25, 0.35]$

(b) Using 0.25 as a first approximation to α, apply the Newton–Raphson process once to $\mathrm{f}(x)$ to determine a second approximation to α, giving your answer to 3 decimal places.

(2)

The equation $\mathrm{f}(x) = 0$ has a root β in the interval $[1.65, 1.7]$

(c) Use linear interpolation once on the interval $[1.65, 1.7]$ to determine an approximation to β, giving your answer to 3 decimal places.

(3)

(Total for Question 4 is 7 marks)

5. The complex numbers z and w satisfy the simultaneous equations

$$3z + \mathrm{i}w = -1 + \mathrm{i}$$

$$kz - w = -9\mathrm{i}$$

where k is a real constant.

(a) Show that

$$z = \frac{24 + k + (3 - 8k)\mathrm{i}}{9 + k^2}$$

(3)

Given that $k = 2$

(b) show that $w = 4 + 7\mathrm{i}$

(2)

(c) Hence determine, in simplest form, the exact value of

(i) $\dfrac{|w|}{|z|}$

(ii) $\arg(z + w)$

(3)

(Total for Question 5 is 8 marks)

6.

$$\mathbf{A} = \begin{pmatrix} 3 & -2 \\ 2 & -1 \end{pmatrix}$$

(a) Prove by induction that, for $n \in \mathbb{Z}^+$

$$\mathbf{A}^n = \begin{pmatrix} 2n+1 & -2n \\ 2n & 1-2n \end{pmatrix}$$

(5)

$$\mathbf{B} = \begin{pmatrix} p & -2 \\ -4 & 2 \end{pmatrix}$$

where p is a constant.

Given that

$$\mathbf{C} = \mathbf{A}^5 - \mathbf{AB} + 7\mathbf{I}$$

where $\mathbf{I}$ is the 2×2 identity matrix,

(b) use the result in part (a) to show that

$$\mathbf{C} = \begin{pmatrix} 10-3p & 0 \\ 6-2p & q \end{pmatrix}$$

where q is a constant to be determined.

(3)

(c) Describe fully the single transformation represented by $\mathbf{C}$ when $p = 3$

(2)

(Total for Question 6 is 10 marks)

7. The quadratic equation $2x^2 - 3x + 5 = 0$ has roots α and β.

You must answer parts (a) and (b) without solving the quadratic equation.

(a) Show that

$$(\alpha + 1)^3 (\beta + 1)^3 = 125$$

(3)

(b) Determine a quadratic equation with integer coefficients which has roots

$$\frac{1}{(\alpha + 1)^3} \quad \text{and} \quad \frac{1}{(\beta + 1)^3}$$

(5)

(Total for Question 7 is 8 marks)

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8. (a) Prove by induction that, for $n \in \mathbb{Z}^+$

$$\sum_{r=1}^{n} r^3 = \frac{1}{4} n^2 (n + 1)^2$$

(5)

(b) Hence determine the value of n for which

$$\sum_{r=2n}^{4n-1} r^3 = 1363 \left(\sum_{r=1}^{n} 1 \right)^2$$

(4)

(Total for Question 8 is 9 marks)

9. The parabola C has equation $y^2 = 12x$

The point $P(3p^2, 6p)$, where $p \neq 0$, lies on C.

(a) Use calculus to show that the normal to C at P has equation

$$y + px = 6p + 3p^3$$

(3)

The point $Q(3q^2, 6q)$, where $q \neq 0$ and $q \neq p$, also lies on C.

Given that the chord PQ passes through the focus of C,

(b) show that $pq = -1$

(4)

The normal to C at P and the normal to C at Q intersect at the point R.

(c) Show that R has coordinates

$$\left(a(p+q)^2 + b,\ c(p+q)\right)$$

where a, b and c are integers to be determined.

(5)

Given that P has coordinates $(12, 12)$

(d) determine, in simplest form, the exact coordinates of R.

(2)

(Total for Question 9 is 14 marks)

TOTAL FOR PAPER IS 75 MARKS

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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

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Thursday 21 May 2026

Afternoon (Time: 1 hour 30 minutes)

Paper reference **WFM01/01A**

Mathematics

International Advanced Subsidiary/Advanced Level
Further Pure Mathematics F1
Answer Book

You must have:
Question paper (sent separately)
Mathematical Formulae and Statistical Tables (Yellow), calculator

Total Marks

Candidates may use any calculator allowed by Pearson regulations. Calculators must not have the facility for symbolic algebra 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.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ▶

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Question 1

Write the answer to Question 1 on these 2 pages

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Question 1 continued

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(Total for Question 1 is 5 marks)

Question 2

Write the answer to Question 2 on these 4 pages

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Question 2 continued

Question 2 continued

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Question 2 continued

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(Total for Question 2 is 6 marks)

Question 3

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Question 3 continued

Question 3 continued

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Question 3 continued

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(Total for Question 3 is 8 marks)

Question 4

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Question 4 continued

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Question 4 continued

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(Total for Question 4 is 7 marks)

Question 5

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Question 5 continued

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Question 5 continued

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(Total for Question 5 is 8 marks)

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Question 6

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Question 6 continued

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(Total for Question 6 is 10 marks)

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Question 7

Write the answer to Question 7 on these 4 pages

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Question 7 continued

Question 7 continued

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Question 7 continued

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(Total for Question 7 is 8 marks)

Question 8

Write the answer to Question 8 on these 4 pages

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Question 8 continued

Question 8 continued

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Question 8 continued

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(Total for Question 8 is 9 marks)

Question 9

Write the answer to Question 9 on these 5 pages

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Question 9 continued

Question 9 continued

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Question 9 continued

Question 9 continued

(Total for Question 9 is 14 marks)

TOTAL FOR PAPER IS 75 MARKS

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