GradeMax

Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Monday 1 June 2026

Afternoon (Time: 1 hour 30 minutes)

Paper reference **WFM02/01**

Mathematics

International Advanced Subsidiary/ Advanced Level
Further Pure Mathematics F2

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

Total Marks

Candidates may use any calculator permitted 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 8 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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Pearson

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

$$z_1 = \frac{1}{2}\left(\cos\frac{4\pi}{5} + \mathrm{i}\sin\frac{4\pi}{5}\right) \qquad z_2 = \sqrt{3} - 3\mathrm{i}$$

(a) Giving the answers in the form $re^{i\theta}$ where $-\pi < \theta \leqslant \pi$, determine the exact values of

(i) $\dfrac{1}{(z_1)^3}$

(ii) $\dfrac{48z_1}{z_2}$

(6)

(b) Determine the exact values of z for which

$$z^2 = z_1$$

Give the answers in the form $r(\cos\theta + \mathrm{i}\sin\theta)$ where $-\pi < \theta \leqslant \pi$

(3)

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Question 1 continued

(Total for Question 1 is 9 marks)

2. (i) $$f(x) = (1 + 4x)^2 \ln(1 + 4x) \qquad x > -\frac{1}{4}$$

(a) Show that

$$f''(x) = A\ln(1 + 4x) + B$$

where A and B are constants to be determined.

(3)

(b) Hence write down the coefficient of the term in x^2 in the Maclaurin series expansion of $f(x)$.

(1)

(ii) $$\frac{d^2y}{dx^2} + (3x - 1)\frac{dy}{dx} + 2y^2 = 5$$

Given that $y = 2$ and $\frac{dy}{dx} = -3$ at $x = 1$, determine the Taylor series expansion for y in ascending powers of $(x - 1)$, up to and including the term in $(x - 1)^3$, giving each coefficient in simplest form.

(6)

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Question 2 continued

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Question 2 continued

(Total for Question 2 is 10 marks)

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

Given that

$$\frac{x+k}{x-3} \geqslant \frac{3x}{x+4}$$

where k is a constant,

(a) show that

$$(x-3)(x+4)\left(2x^2-(k+A)x-4k\right) \leqslant 0$$

where A is a constant to be determined.

(3)

(b) Hence, or otherwise, determine the range of values of x for which

$$\frac{x+2}{x-3} \geqslant \frac{3x}{x+4}$$

(4)

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Question 3 continued

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Question 3 continued

(Total for Question 3 is 7 marks)

4. (a) Determine the general solution of the differential equation

$$x\frac{\mathrm{d}y}{\mathrm{d}x} + 2y = 12x^2\sqrt{x^4 + 9} \qquad x > 0$$

giving the answer in the form $y = \mathrm{f}(x)$.

(5)

Given that $y = \frac{715}{12}$ at $x = 2$

(b) determine the particular solution of the differential equation, giving the answer in the form $y = \mathrm{g}(x)$.

(2)

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Question 4 continued

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Question 4 continued

(Total for Question 4 is 7 marks)

5. $$\mathrm{f}(r) = \frac{1}{r(r+1)} \quad r > 0$$

(a) Express $\mathrm{f}(r)$ in partial fractions.

(1)

$$\mathrm{g}(r) = \frac{12r^4 + 12r^3 + kr^2 + kr + 1}{r(r+1)} \quad r > 0$$

where k is a constant.

Given that

$$\mathrm{g}(r) = \mathrm{h}(r) + \mathrm{f}(r)$$

(b) show that

$$\mathrm{h}(r) = 12r^2 + k$$

You must make your method clear.

(1)

(c) Hence, using the standard results for summations and the method of differences, show that

$$(n+1)\sum_{r=1}^{n} \mathrm{g}(r) = 4n^4 + 10n^3 + (k + A)n^2 + (k + 3)n$$

where A is a constant to be found.

(5)

Given that

$$(n+1)\sum_{r=1}^{n} \mathrm{g}(r) = n(n+2)(4n^2 + 2n - 1)$$

(d) determine the value of k.

You must make your method clear.

(2)

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Question 5 continued

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Question 5 continued

(Total for Question 5 is 9 marks)

6.

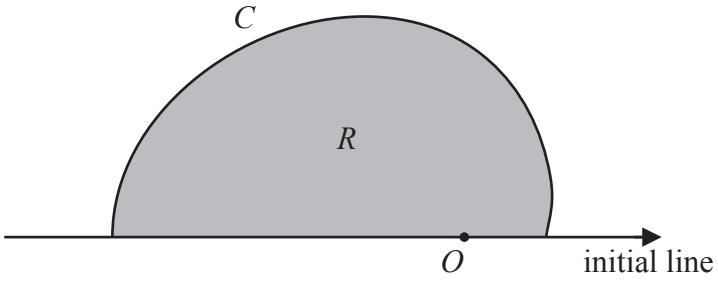


Figure 1

The polar curve C has equation

$$r = k - 2\cos\theta \qquad 0 \leqslant \theta \leqslant \pi$$

where k is a constant and $k > 2$

The region R, shown shaded in Figure 1, is bounded by C, the line with equation $\theta = \pi$ and the initial line.

Given that the area of R is $\left(4 + \sqrt{5}\right)\pi$

(a) use algebraic integration to show that

$$k^2 = 6 + 2\sqrt{5}$$

(4)

The tangent to C at the point P, where $0 < \theta < \pi$, is perpendicular to the initial line.

(b) Use calculus to determine the polar coordinates of P.

(5)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 9 marks)

7. (a) Show that the substitution $y = z\cos x$, where z is a function of x, transforms the differential equation

$$\left(\cos^2 x\right)\frac{\mathrm{d}^2y}{\mathrm{d}x^2} + \left(\sin 2x\right)\frac{\mathrm{d}y}{\mathrm{d}x} + 2y = \left(12\cos 2x\right)\cos^3 x \qquad \text{(I)}$$

into the differential equation

$$\frac{\mathrm{d}^2z}{\mathrm{d}x^2} + z = 12\cos 2x \qquad \text{(II)}$$

(5)

It is given that $z = \lambda\cos 2x$, where λ is a constant, is a particular integral of differential equation (II).

(b) By solving differential equation (II), determine the general solution of differential equation (I), giving the answer in the form $y = \mathrm{f}(x)$.

(4)

The graph of a particular solution to differential equation (I) passes through the points $(0, 1)$, $\left(\frac{3\pi}{4}, 4\right)$ and $\left(\frac{\pi}{3}, p\right)$ where p is a constant.

(c) Show that $p = q\left(3 - \sqrt{3}\right)$ where q is a rational number to be determined.

(4)

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Question 7 continued

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Question 7 continued

(Total for Question 7 is 13 marks)

8. The curve C in the z-plane, where $z = x + \mathrm{i}y$, has equation

$$y = \frac{1}{2}\left(x^2 - 4x + 3\right)$$

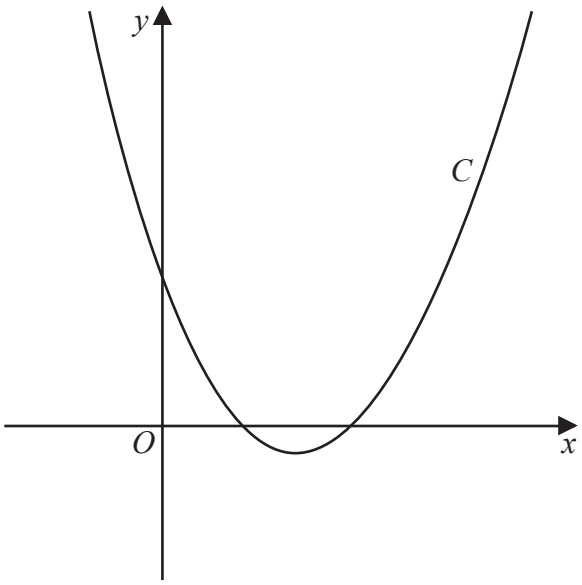


Figure 2

A sketch of the graph of C is shown in Figure 2.

Given that the line with equation $y = mx$ is a tangent to C

(a) determine the exact possible values of m.

(3)

(b) Hence determine the range of values of $\arg z$ for points on C, giving the answer in degrees.

(3)

The transformation T from the z-plane, where $z = x + \mathrm{i}y$, to the w-plane, where $w = u + \mathrm{i}v$, is given by

$$w = \mathrm{i}\left(x - 2\mathrm{i}\right)^2 + 2y - 5\mathrm{i}$$

Curve C is mapped by T onto the straight line l

(c) Determine an equation for l, giving the answer in the form $v = \mathrm{f}\left(u\right)$.

(3)

(d) Hence determine the minimum value of $|w|$ for points on l, giving the answer in the form $k\sqrt{2}$ where k is an integer.

(2)

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Question 8 continued

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Question 8 continued

Question 8 continued

(Total for Question 8 is 11 marks)

TOTAL FOR PAPER IS 75 MARKS

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