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

Friday 16 January 2026

Morning (Time: 1 hour 30 minutes)

Paper reference **WFM02/01**

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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 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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1. (a) Express

$$\frac{1}{(3n-1)(3n+5)}$$

in partial fractions.

(2)

(b) Hence, using the method of differences, show that for all positive integer values of n,

$$\sum_{r=1}^{n} \frac{20}{(3r-1)(3r+5)} \equiv \frac{n(An+B)}{(3n+C)(3n+D)}$$

where A, B, C and D are integers to be determined.

(4)

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Question 1 continued

Question 1 continued

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Question 1 continued

(Total for Question 1 is 6 marks)

2. $$y = (1 - 3x)^A + e^{Bx}$$

where A and B are non-zero constants.

(a) Determine $\frac{d^3y}{dx^3}$ in terms of A, B and x.

(3)

Given that the Maclaurin series expansion for y in ascending powers of x, up to and including the term in x^3, is

$$y = 2 + kx^3$$

where k is a constant,

(b) determine the value of A and the value of B.

(4)

(c) Hence determine the value of k, giving your answer as a fully simplified fraction.

(3)

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Question 2 continued

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Question 2 continued

(Total for Question 2 is 10 marks)

3. (a) Show that the transformation $u = y^{-4}$ transforms the differential equation

$$4\frac{dy}{dx} = y - 2xy^5 \qquad \text{(I)}$$

into the differential equation

$$\frac{du}{dx} + u = 2x \qquad \text{(II)}$$

(3)

(b) Solve differential equation (II) to determine a general solution for u in terms of x.

(5)

(c) Hence determine the particular solution of differential equation (I) for which $y = 1$ at $x = 0$, giving your answer in the form $y^4 = f(x)$

(2)

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Question 3 continued

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Question 3 continued

(Total for Question 3 is 10 marks)

4. $$\frac{d^2y}{dx^2} = x^2y + \frac{dy}{dx}$$

(a) Show that

$$\frac{d^4y}{dx^4} = \frac{d^3y}{dx^3} + Ax^2\frac{d^2y}{dx^2} + Bx\frac{dy}{dx} + Cy$$

where A, B and C are integers to be determined.

(4)

Given that $\frac{dy}{dx} = 3$ and $y = 1$ at $x = 1$

(b) determine the Taylor series solution for y in ascending powers of $(x - 1)$, up to and including the term in $(x - 1)^4$, giving each coefficient in simplest form.

(4)

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Question 4 continued

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Question 4 continued

(Total for Question 4 is 8 marks)

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

Use algebra to determine the values of x for which

$$\left|\frac{x^2 + 5x - 2}{x^2 + 1}\right| < 2 \qquad x \in \mathbb{R}$$

(6)

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Question 5 continued

(Total for Question 5 is 6 marks)

6. The transformation T from the z-plane, where $z = x + iy$, to the w-plane, where $w = u + iv$, is given by

$$w = \frac{z + 2}{3z + 4} \qquad z \neq -\frac{4}{3}$$

The circle C in the z-plane has equation

$$(x + 1)^2 + (y - 1)^2 = 1$$

Given that T maps C to the circle D in the w-plane, determine the equation of D, giving your answer in the form

$$u^2 + v^2 + au + bv + c = 0$$

where a, b and c are real numbers.

(7)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 7 marks)

7. Given that

$$\sin\theta = \frac{1}{2\mathrm{i}}\left(\mathrm{e}^{\mathrm{i}\theta} - \mathrm{e}^{-\mathrm{i}\theta}\right)$$

(a) show that

$$\sin^4\theta = \frac{1}{8}(A\cos 4\theta + B\cos 2\theta + C)$$

where A, B and C are integers to be determined.

(4)

Using $\cos\theta \equiv \sin\left(\frac{1}{2}\pi - \theta\right)$ and the result from part (a),

(b) determine an expression for $\cos^4\theta$ in terms of $\cos 4\theta$ and $\cos 2\theta$

(2)

(c) Hence determine

$$\int\left(\sin^4\theta + \cos^4\theta\right)\mathrm{d}\theta$$

(2)

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Question 7 continued

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Question 7 continued

(Total for Question 7 is 8 marks)

8. (a) Given that $u = xy$, where u is a function of x ($x > 0$), show that

$$\frac{\mathrm{d}^2y}{\mathrm{d}x^2} = \frac{1}{x}\left(\frac{\mathrm{d}^2u}{\mathrm{d}x^2} - 2\frac{\mathrm{d}y}{\mathrm{d}x}\right)$$

(3)

(b) Hence show that the transformation $u = xy$ transforms the differential equation

$$x\frac{\mathrm{d}^2y}{\mathrm{d}x^2} + 2(2x+1)\frac{\mathrm{d}y}{\mathrm{d}x} + 13xy = 17\mathrm{e}^{3x} - 4y \qquad \text{(I)}$$

into the differential equation

$$\frac{\mathrm{d}^2u}{\mathrm{d}x^2} + 4\frac{\mathrm{d}u}{\mathrm{d}x} + 13u = 17\mathrm{e}^{3x} \qquad \text{(II)}$$

(2)

(c) Solve differential equation (II) to determine a general solution for u in terms of x.

(5)

(d) Hence determine the general solution of differential equation (I).

(1)

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Question 8 continued

Question 8 continued

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Question 8 continued

(Total for Question 8 is 11 marks)

9.

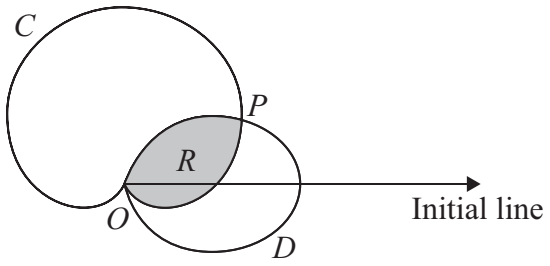


Figure 1

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

Figure 1 shows a sketch of the curve C with polar equation

$$r = 1 + \sin\theta \qquad -\frac{\pi}{2} \leqslant \theta \leqslant \frac{3\pi}{2}$$

and a sketch of the curve D with polar equation

$$r = 1 + \cos 2\theta \qquad -\frac{\pi}{2} \leqslant \theta \leqslant \frac{\pi}{2}$$

The curves intersect at the pole O and at the point P as shown.

(a) Determine the polar coordinates of P.

(3)

The finite region R, shown shaded in Figure 1, is bounded by C and D.

(b) Use algebraic integration to show that the area of R is

$$a\pi + b\sqrt{3}$$

where a and b are rational numbers to be determined.

(6)

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Question 9 continued

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Question 9 continued

Question 9 continued

(Total for Question 9 is 9 marks)

TOTAL FOR PAPER IS 75 MARKS

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