Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

考前模拟卷 - **A Level Clouds**出品

Morning (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 ▶

Pearson

1. Given that

$$y\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right)^2 - 2y = 0 \qquad y > 0$$

(a) determine $\dfrac{d^3y}{dx^3}$ in terms of $\dfrac{d^2y}{dx^2}$, $\dfrac{dy}{dx}$ and y

(4)

Given that $y = 2$ and $\dfrac{dy}{dx} = 1$ at $x = 0$

(b) determine a series solution for y in ascending powers of x, up to and including the term in x^3, giving each coefficient in its simplest form.

(4)

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Question 1 continued

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Question 1 continued

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Question 1 continued

(Total for Question 1 is 8 marks)

2. Using the method of differences, find

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

(5)

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Question 2 continued

(Total for Question 2 is 5 marks)

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3. (a) Show that the substitution $v = y^{-2}$ transforms the differential equation

$$\frac{dy}{dx} + 6xy = 3xe^{x^2}y^3 \qquad x > 0 \qquad \text{(I)}$$

into the differential equation

$$\frac{dv}{dx} - 12vx = -6xe^{x^2} \qquad x > 0 \qquad \text{(II)}$$

(4)

(b) Hence find the general solution of the differential equation (I), giving your answer in the form $y^2 = f(x)$.

(6)

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Question 3 continued

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Question 3 continued

Question 3 continued

(Total for Question 3 is 10 marks)

4. Use algebra to obtain the set of values of x for which

$$\left|\frac{x^2 + 3x + 10}{x + 2}\right| < 7 - x$$

(8)

Question 4 continued

(Total for Question 4 is 8 marks)

5. A 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

$$w = \frac{z-3}{2\mathrm{i}-z} \qquad z \neq 2\mathrm{i}$$

The line in the z-plane with equation $y = x + 3$ is mapped by T onto a circle C in the w-plane.

(a) Determine

(i) the coordinates of the centre of C

(ii) the exact radius of C

(8)

The region $y > x + 3$ in the z-plane is mapped by T onto the region R in the w-plane.

(b) On a single Argand diagram

(i) sketch the circle C

(ii) shade and label the region R

(2)

Question 5 continued

Question 5 continued

Question 5 continued

(Total for Question 5 is 10 marks)

6. (a) Use de Moivre's theorem to show that

$$\cos^5 \theta \equiv p \cos 5\theta + q \cos 3\theta + r \cos\theta$$

where p, q and r are rational numbers to be found.

(6)

(b) Hence, showing all your working, find the exact value of

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \cos^5\theta \, d\theta$$

(4)

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Question 6 continued

Question 6 continued

Question 6 continued

(Total for Question 6 is 10 marks)

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7.

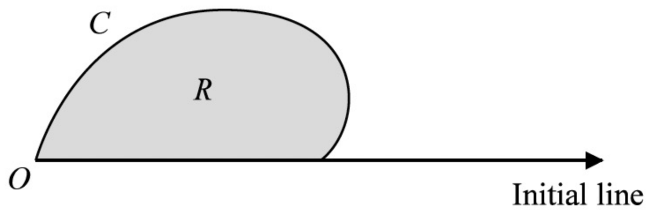

Figure 1

The curve C shown in Figure 1 has polar equation

$$r = \sin\theta + \cos 2\theta \qquad 0 \leqslant \theta \leqslant \frac{\pi}{2}$$

At the point P on C the tangent to C is parallel to the initial line.

Given that O is the pole,

(a) find the length of the line of OP, giving your answer to 3 significant figures.

(6)

The region R, shown shaded in Figure 1, is bounded by the curve C and the initial line.

(b) Use calculus to find the exact area of R.

(6)

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Question 7 continued

Question 7 continued

Question 7 continued

(Total for Question 7 is 12 marks)

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8. (a) Show that the substitution $x = e^t$ transforms the differential equation

$$x^2\frac{d^2y}{dx^2} + 5x\frac{dy}{dx} + 13y = 0, \qquad x > 0 \qquad \text{(I)}$$

into the differential equation

$$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 13y = 0$$

(7)

(b) Hence find the general solution of the differential equation (I).

(5)

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Question 8 continued

Question 8 continued

(Total for Question 8 is 12 marks)

TOTAL FOR PAPER IS 75 MARKS