Write your name here

Surname | Other names

Pearson Edexcel GCE

Centre Number | Candidate Number

A level Further Mathematics

Core Pure Mathematics

Practice Paper 5

You must have:
Mathematical Formulae and Statistical Tables (Pink)

Total Marks

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 the 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 **74**.
- The marks for each question are shown in brackets – use this as a guide as to how much time to spend on each question.
- Calculators must not be used for questions marked with a * sign.

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.

1. The complex number z is given by

$$z = \frac{p + 2\mathrm{i}}{3 + p\mathrm{i}}$$

where p is an integer.

(a) Express z in the form $a + b\mathrm{i}$ where a and b are real. Give your answer in its simplest form in terms of p.

(4)

(b) Given that $\arg(z) = \theta$, where $\tan\theta = 1$ find the possible values of p.

(5)

(Total 9 marks)

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2. $$\mathrm{f}(x) = 2x^3 - 6x^2 - 7x - 4.$$

(a) Show that $\mathrm{f}(4) = 0$.

(1)

(b) Use algebra to solve $\mathrm{f}(x) = 0$ completely.

(4)

(Total 5 marks)

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3. The curve C has polar equation

$$r = 1 + 2\cos\theta, \qquad 0 \leq \theta \leq \frac{\pi}{2}.$$

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

Given that O is the pole, find the exact length of the line OP.

(Total 7 marks)

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4. Find the general solution of the differential equation

$$x\frac{\mathrm{d}y}{\mathrm{d}x} + 5y = \frac{\ln x}{x}, \quad x > 0,$$

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

(Total 8 marks)

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5. The line l passes through the point $P(2, 1, 3)$ and is perpendicular to the plane Π whose vector equation is

$$\mathbf{r}.(\mathbf{i} - 2\mathbf{j} - \mathbf{k}) = 3$$

Find

(a) a vector equation of the line l,

(2)

(b) the position vector of the point where l meets Π.

(4)

(c) Hence find the perpendicular distance of P from Π.

(2)

(Total 8 marks)

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6. $$z = -8 + (8\sqrt{3})\mathrm{i}$$

(a) Find the modulus of z and the argument of z.

(3)

Using de Moivre's theorem,

(b) find z^3,

(2)

(c) find the values of w such that $w^4 = z$, giving your answers in the form $a + \mathrm{i}b$, where $a, b \in \mathbb{R}$.

(5)

(Total 10 marks)

7. (i) Find, without using a calculator,

$$\int_3^5 \frac{1}{\sqrt{15+2x-x^2}}\,\mathrm{d}x$$

giving your answer as a multiple of π.

(5)

(ii) (a) Show that

$$5\cosh x - 4\sinh x = \frac{\mathrm{e}^{2x}+9}{2\mathrm{e}^x}.$$

(3)

(b) Hence, using the substitution $u = \mathrm{e}^x$ or otherwise, find

$$\int \frac{1}{5\cosh x - 4\sinh x}\,\mathrm{d}x.$$

(4)

(Total 12 marks)

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8. The differential equation

$$\frac{\mathrm{d}^2x}{\mathrm{d}t^2} + 6\frac{\mathrm{d}x}{\mathrm{d}t} + 9x = \cos 3t, \qquad t \geq 0,$$

describes the motion of a particle along the x-axis.

(a) Find the general solution of this differential equation.

(8)

(b) Find the particular solution of this differential equation for which, at $t = 0$, $x = \frac{1}{2}$ and $\frac{\mathrm{d}x}{\mathrm{d}t} = 0$.

(5)

On the graph of the particular solution defined in part (*b*), the first turning point for $t > 30$ is the point A.

(c) Find approximate values for the coordinates of A.

(2)

(Total 15 marks)

TOTAL FOR PAPER: 74 MARKS