Write your name here

Surname	Other names

Pearson Edexcel
International Advanced Level

Centre Number | Candidate Number

Further Pure Mathematics F2

Advanced/Advanced Subsidiary

Friday 6 June 2014 – Afternoon
Time: 1 hour 30 minutes

Paper Reference
WFM02/01

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

Total Marks

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. 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). Coloured pencils and highlighter pens must not be used.
- **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.
- When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information

- 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.

Turn over ▶

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P 4 4 5 1 7 A 0 1 3 2

PEARSON

PMT

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1. (a) Show that

$$\frac{1}{(r+1)(r+2)(r+3)} \equiv \frac{1}{2(r+1)(r+2)} - \frac{1}{2(r+2)(r+3)}$$

(2)

(b) Hence, or otherwise, find

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

giving your answer as a single fraction in its simplest form.

(4)

Leave blank

2. Use algebra to find the set of values of x for which

$$\frac{6}{x-3} \leqslant x + 2$$

(7)

PMT

Leave blank

3. Solve the equation

$$z^5 = 16 - 16\mathrm{i}\sqrt{3}$$

giving your answers in the form $r\mathrm{e}^{\mathrm{i}\theta}$ where θ is in terms of π and $0 \leqslant \theta < 2\pi$.

(5)

Leave blank

4. A transformation from the z-plane to the w-plane is given by

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

Under this transformation, the circle $|z| = 2$ in the z-plane is mapped onto a circle C in the w-plane.

Determine the centre and the radius of the circle C.

(7)

PMT

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Question 4 continued

PMT

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5.

$$\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 0$$

(a) Show that

$$\frac{d^4y}{dx^4} = \left(ax^2 + b\right)\frac{d^2y}{dx^2}$$

where a and b are constants to be found.

(5)

Given that $y = 1$ and $\frac{dy}{dx} = 3$ at $x = 0$

(b) find a series solution for y in ascending powers of x up to and including the term in x^4

(5)

(c) use your series to estimate the value of y at $x = -0.2$, giving your answer to four decimal places.

(2)

Leave blank

Question 5 continued

Leave blank

6.

$$x\frac{\mathrm{d}y}{\mathrm{d}x} + (1 - 2x)y = x, \qquad x > 0$$

Find the general solution of the differential equation, giving your answer in the form $y = \mathrm{f}(x)$.

(9)

Leave blank

7. The point P represents a complex number z on an Argand diagram, where

$$|z+1| = |2z-1|$$

and the point Q represents a complex number w on the Argand diagram, where

$$|w| = |w-1+\mathrm{i}|$$

Find the exact coordinates of the points where the locus of P intersects the locus of Q.

(7)

Leave blank

Question 7 continued

Turn over

P 4 4 5 1 7 A 0 2 1 3 2

PMT

Leave blank

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

P 4 4 5 1 7 A 0 2 5 3 2

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9.

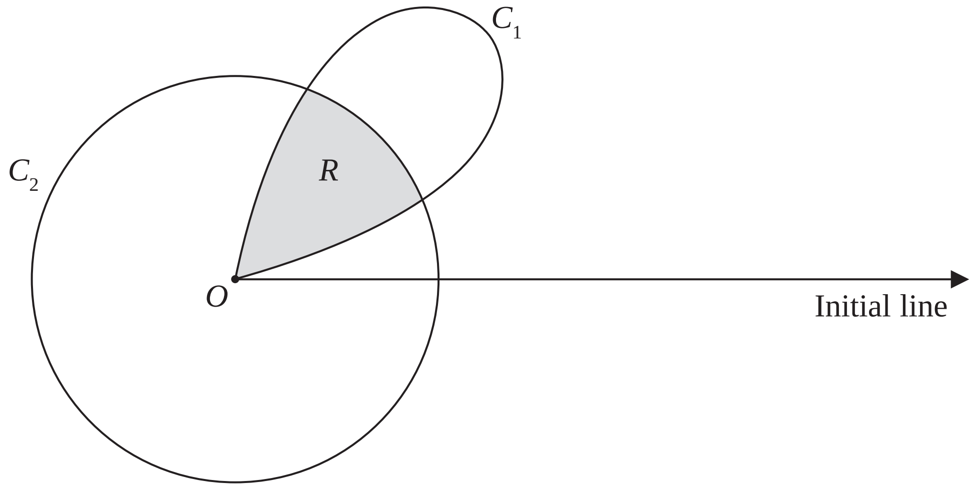

Figure 1

Figure 1 shows the curve C_1 with polar equation $r = 2a\sin 2\theta$, $0 \leqslant \theta \leqslant \frac{\pi}{2}$, and the circle C_2 with polar equation $r = a$, $0 \leqslant \theta \leqslant 2\pi$, where a is a positive constant.

(a) Find, in terms of a, the polar coordinates of the points where the curve C_1 meets the circle C_2

(3)

The regions enclosed by the curve C_1 and the circle C_2 overlap and the common region R is shaded in Figure 1.

(b) Find the area of the shaded region R, giving your answer in the form $\frac{1}{12}a^2\left(p\pi + q\sqrt{3}\right)$, where p and q are integers to be found.

(7)

PMT

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Question 9 continued

Q9

(Total 10 marks)

TOTAL FOR PAPER: 75 MARKS

END