Write your name here

Surname	Other names

Pearson Edexcel GCE

Centre Number	Candidate Number

Further Pure Mathematics FP2

Advanced/Advanced Subsidiary

Wednesday 6 June 2018 – Morning
Time: 1 hour 30 minutes

Paper Reference
6668/01

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

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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1. (a) Express $\dfrac{1}{(r+3)(r+4)}$ in partial fractions.

(1)

(b) Hence, using the method of differences, show that

$$\sum_{r=1}^{n} \frac{1}{(r+3)(r+4)} = \frac{n}{a(n+a)}$$

where a is a constant to be found.

(5)

(c) Find the exact value of $\displaystyle\sum_{r=15}^{30} \frac{1}{(r+3)(r+4)}$

(2)

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Question 1 continued

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Question 1 continued

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Question 1 continued

Q1

(Total 8 marks)

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

$$w = \frac{1 - iz}{z}, \qquad z \neq 0$$

The transformation maps points on the real axis in the z-plane onto the line l in the w-plane.
Find an equation of the line l.

(4)

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Question 2 continued

Q2

(Total 4 marks)

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3. (a) By writing $\frac{\pi}{12} = \frac{\pi}{3} - \frac{\pi}{4}$, show that

(i) $\sin\left(\frac{\pi}{12}\right) = \frac{1}{4}\left(\sqrt{6} - \sqrt{2}\right)$

(ii) $\cos\left(\frac{\pi}{12}\right) = \frac{1}{4}\left(\sqrt{6} + \sqrt{2}\right)$

(4)

(b) Hence find the exact values of z for which

$$z^4 = 4\left(\cos\frac{\pi}{3} + \mathrm{i}\sin\frac{\pi}{3}\right)$$

Give your answers in the form $z = a + \mathrm{i}b$ where $a, b \in \mathbb{R}$

(5)

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Question 3 continued

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Question 3 continued

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Question 3 continued

Q3

(Total 9 marks)

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

$$|x^2 - 2| > 4x$$

(7)

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Question 4 continued

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Question 4 continued

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Question 4 continued

Q4

(Total 7 marks)

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5.

$$y\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - 3y^2 = 0$$

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

(a) show that, at $x = 0$, $\frac{d^3y}{dx^3} = \frac{3}{2}$

(6)

(b) Find a series solution for y up to and including the term in x^3

(3)

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Question 5 continued

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Question 5 continued

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Question 5 continued

Q5

(Total 9 marks)

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

$$6\frac{d^2y}{dx^2} + 5\frac{dy}{dx} - 6y = x - 6x^2$$

(8)

(b) Find the particular solution for which $y = 0$ and $\frac{dy}{dx} = \frac{3}{2}$ when $x = 0$

(5)

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Question 6 continued

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Question 6 continued

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Question 6 continued

(Total 13 marks)

Q6

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7.

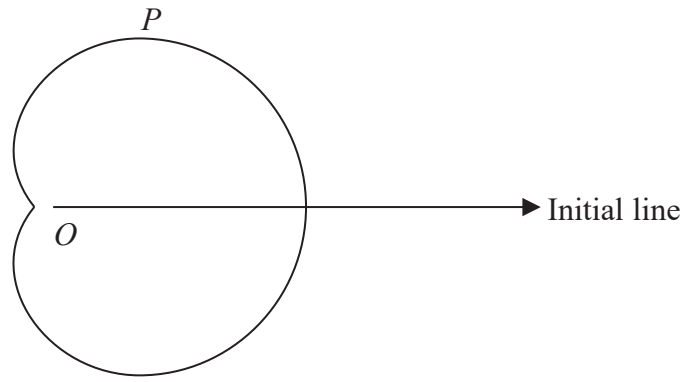

Figure 1

The curve C shown in Figure 1 has polar equation

$$r = 2 + \sqrt{3}\cos\theta, \qquad 0 \leqslant \theta < 2\pi$$

The tangent to C at the point P is parallel to the initial line.

(a) Show that $OP = \frac{1}{2}(3 + \sqrt{7})$

(6)

(b) Find the exact area enclosed by the curve C.

(6)

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Question 7 continued

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Question 7 continued

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Question 7 continued

(Total 12 marks)

Q7

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8. (a) Using the substitution $t = x^2$, or otherwise, find

$$\int 2x^5 e^{-x^2} dx$$

(6)

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

$$x\frac{dy}{dx} + 4y = 2x^2 e^{-x^2}$$

giving your answer in the form $y = f(x)$.

(4)

Given that $y = 0$ when $x = 1$

(c) find the particular solution of this differential equation, giving your solution in the form $y = f(x)$.

(3)

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Question 8 continued

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Question 8 continued

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Question 8 continued

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Question 8 continued

Q8

(Total 13 marks)

TOTAL FOR PAPER: 75 MARKS

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