

Write your name here

Surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--	--

Further Pure Mathematics F2

Advanced/Advanced Subsidiary

Wednesday 8 June 2016 – Morning

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 ►

P46685A

©2016 Pearson Education Ltd.

1/1/1/



PEARSON

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

$$\sum_{r=9}^{25} \frac{5}{4r^2 - 1} \quad (2)$$

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Leave
blank

Question 1 continued

Handwriting practice area with horizontal lines.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 4 6 6 8 5 A 0 3 3 2

Leave
blank

[illegible]

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 1 continued

Q1

(Total 6 marks)



P 4 6 6 8 5 A 0 5 3 2

Leave
blank

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

$$|x^2 - 9| < |1 - 2x|$$

(6)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 2 continued

Q2

(Total 6 marks)



P 4 6 6 8 5 A 0 7 3 2

Leave
blank

3. Find, in terms of k , where k is a positive integer, the general solution of the differential equation

$$(1+x)\frac{dy}{dx} + ky = x^{\frac{1}{2}}(1+x)^{2-k}, \quad x > 0$$

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

(6)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 3 continued

Q3

(Total 6 marks)



Leave
blank

4.

$$f(x) = \sin\left(\frac{3}{2}x\right)$$

- (a) Find the Taylor series expansion for $f(x)$ about $\frac{\pi}{3}$ in ascending powers of $\left(x - \frac{\pi}{3}\right)$ up to and including the term in $\left(x - \frac{\pi}{3}\right)^4$ (6)

- (b) Hence obtain an estimate of $\sin \frac{1}{2}$, giving your answer to 4 decimal places. (2)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 4 continued

Handwriting practice area with horizontal lines.



Question 4 continued

Leave
blank

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 4 continued

Q4

(Total 8 marks)



Leave
blank

5. The transformation T from the z -plane to the w -plane is given by

$$w = \frac{2z - 1}{z + 3}, \quad z \neq -3$$

The circle in the z -plane with equation $x^2 + y^2 = 1$, where $z = x + iy$, is mapped by T onto the circle C in the w -plane.

Find the centre and the radius of C .

(7)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 5 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 4 6 6 8 5 A 0 1 5 3 2

Leave
blank

Question 5 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 5 continued

Q5

(Total 7 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Leave
blank

- $$\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 3x^2 + 2x + 1$$

(9)

- (b) Find the particular solution of this differential equation for which $y = 0$ and $\frac{dy}{dx} = 0$ when $x = 0$

(5)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 6 continued

DONOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 6 continued

Q6

(Total 14 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

7.

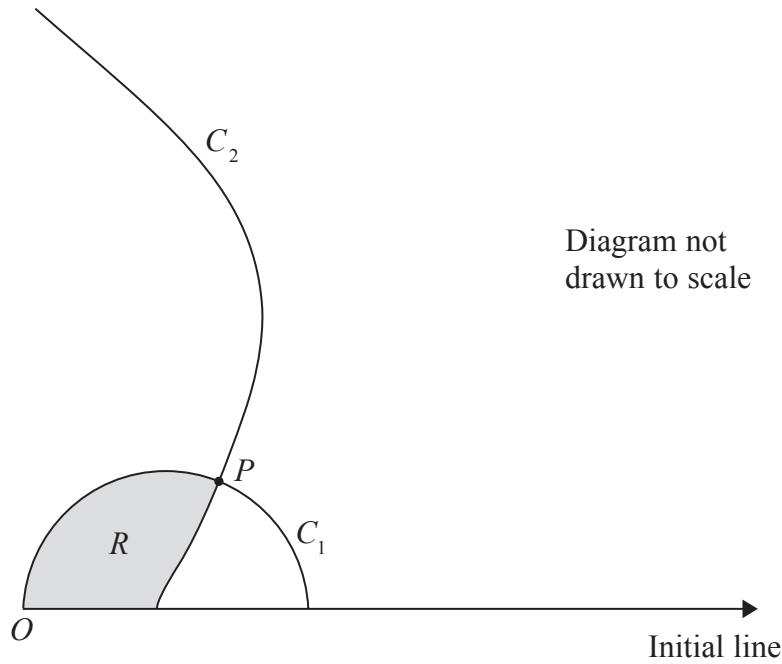


Figure 1

Figure 1 shows a sketch of the curves C_1 and C_2 with polar equations

$$C_1 : r = \frac{3}{2} \cos \theta, \quad 0 \leq \theta \leq \frac{\pi}{2}$$

$$C_2 : r = 3\sqrt{3} - \frac{9}{2} \cos \theta, \quad 0 \leq \theta \leq \frac{\pi}{2}$$

The curves intersect at the point P .

(a) Find the polar coordinates of P .

(3)

The region R , shown shaded in Figure 1, is enclosed by the curves C_1 and C_2 and the initial line.

(b) Find the exact area of R , giving your answer in the form $p\pi + q\sqrt{3}$ where p and q are rational numbers to be found.

(8)

Leave
blank

Question 7 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 4 6 6 8 5 A 0 2 3 3 2

DO NOT WRITE IN THIS AREA

This image shows a full page of blank, lined paper. It features approximately 28 horizontal blue or grey lines spaced evenly apart, typical of standard notebook paper. The lines extend across the entire width of the page, leaving small margins at the top and bottom. There are no vertical lines, text, or other markings on the page.

Leave
blank

Question 7 continued

Q7

(Total 11 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Leave
blank

8. (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)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 4 6 6 8 5 A 0 2 7 3 2

Leave
blank

[illegible]

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 8 continued

Q8

(Total 10 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

- Given that $\arg\left(\frac{z-5}{z-2}\right) = \frac{\pi}{4}$

- (3)

- (4)

DO NOT WRITE IN THIS AREA

Leave
blank

Question 9 continued

Lined area for writing the answer to Question 9.



P 4 6 6 8 5 A 0 3 1 3 2

Leave
blank

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(Total 7 marks)

Q9

TOTAL FOR PAPER: 75 MARKS

END

