

Write your name here

Surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Further Pure Mathematics F3

Advanced/Advanced Subsidiary

Tuesday 10 June 2014 – Morning
Time: 1 hour 30 minutes

Paper Reference

WFM03/01

You must have:

Mathematical Formulae and Statistical Tables (Blue)

Total Marks

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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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Question 4 continued

Lined writing area for the answer to Question 4.

(Total 8 marks)

Q4



5. Given that

$$I_n = \int_0^{\frac{\pi}{4}} \cos^n \theta \, d\theta, \quad n \geq 0$$

(a) prove that, for $n \geq 2$,

$$nI_n = \left(\frac{1}{\sqrt{2}}\right)^n + (n-1)I_{n-2} \tag{6}$$

(b) Hence find the exact value of I_5 , showing each step of your working. (5)



Question 5 continued

Lined writing area for Question 5 continued.

Q5

Grade entry box

(Total 11 marks)



Question 6 continued

A series of horizontal lines for writing the answer to Question 6.



P 4 4 5 1 8 A 0 1 7 2 8

Question 6 continued

Ruled lines for answer entry



7. The curve C has parametric equations

$$x = 3t^2, \quad y = 12t, \quad 0 \leq t \leq 4$$

The curve C is rotated through 2π radians about the x -axis.

(a) Show that the area of the surface generated is

$$\pi(a\sqrt{5} + b)$$

where a and b are constants to be found.

(6)

(b) Show that the length of the curve C is given by

$$k \int_0^4 \sqrt{t^2 + 4} \, dt$$

where k is a constant to be found.

(1)

(c) Use the substitution $t = 2 \sinh \theta$ to show that the exact value of the length of the curve C is

$$24\sqrt{5} + 12 \ln(2 + \sqrt{5})$$

(6)



Question 7 continued

Blank lined area for writing the answer to Question 7.

Q7

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(Total 13 marks)



8. The line l has equation

$$\mathbf{r} = (2\mathbf{i} + \mathbf{j} - 2\mathbf{k}) + \lambda(3\mathbf{i} + 2\mathbf{j} + \mathbf{k}), \text{ where } \lambda \text{ is a scalar parameter,}$$

and the plane Π has equation

$$\mathbf{r} \cdot (\mathbf{i} + \mathbf{j} - 2\mathbf{k}) = 19$$

(a) Find the coordinates of the point of intersection of l and Π . (4)

The perpendicular to Π from the point $A(2, 1, -2)$ meets Π at the point B .

(b) Verify that the coordinates of B are $(4, 3, -6)$. (3)

The point $A(2, 1, -2)$ is reflected in the plane Π to give the image point A' .

(c) Find the coordinates of the point A' . (2)

(d) Find an equation for the line obtained by reflecting the line l in the plane Π , giving your answer in the form

$$\mathbf{r} \times \mathbf{a} = \mathbf{b},$$

where \mathbf{a} and \mathbf{b} are vectors to be found.

(4)



Question 8 continued

Lined writing area for question 8 continuation.



