Please check the examination details	s below before ent	ering your candidate	information
Candidate surname		Other names	
Centre Number Candidate	e Number		
Pearson Edexcel Into	ernation	al Advan	ced Level
Time 1 hour 30 minutes	Paper reference	WFM	02/01
Mathematics			00
International Advanced	Subsidiar	w/Advance	dlovol
		y/Advanced	a Levei
Further Pure Mathemat	ICS F2		
You must have: Mathematical Formulae and Statis	stical Tables (Ye	ellow), calculator	Total Marks

Candidates may use any calculator allowed by Pearson regulations. 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).
- **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.
- 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 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 guestion 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. In this question you must show all stages of your working.

Solutions relying entirely on calculator technology are not acceptable.

(a) Express the complex number

$$-4 - 4\sqrt{3}i$$

in the form $r(\cos\theta + i\sin\theta)$, where r > 0 and $-\pi < \theta \leqslant \pi$

(3)

(b) Solve the equation

$$z^3 + 4 + 4\sqrt{3}i = 0$$

giving your answers in the form $re^{i\theta}$, where r>0 and $-\pi<\theta\leqslant\pi$

(4)

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Question 1 continued	



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	Q1
(Total 7 m	arks)



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Z .	Determine	me genera	u solulion	or me	differential	eduation

$$2\frac{d^2y}{dx^2} - 5\frac{dy}{dx} - 3y = 2e^{3x}$$

$\frac{1}{3} \frac{1}{dx} - 3y$	= 2e***		

(6)

Question 2 continued
$oxed{Q2}$
(Total 6 marks)



3.

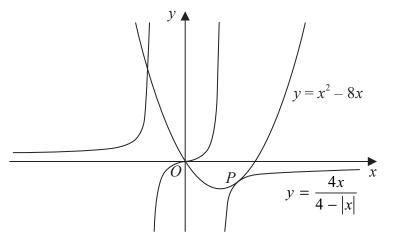


Figure 1

Figure 1 shows a sketch of the curve C_1 with equation

$$y = \frac{4x}{4 - |x|}$$

and the curve C_2 with equation

$$y = x^2 - 8x$$

For x > 0, C_1 has equation $y = \frac{4x}{4 - x}$

- (a) Use algebra to show that C_1 touches C_2 at a point P, stating the coordinates of P (5)
- (b) Hence or otherwise, using algebra, solve the inequality

$$x^2 - 8x > \frac{4x}{4 - |x|} \tag{6}$$

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Question 3 continued

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4.

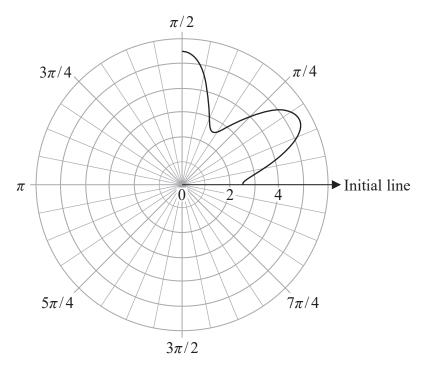


Figure 2

Figure 2 shows part of the curve with polar equation

$$r = 4 - \frac{3}{2}\cos 6\theta \qquad 0 \leqslant \theta < 2\pi$$

- (a) Sketch, on the polar grid in Figure 2,
 - (i) the rest of the curve with equation $r = 4 \frac{3}{2}\cos 6\theta$ $0 \le \theta < 2\pi$
 - (ii) the polar curve with equation r = 1 $0 \le \theta < 2\pi$

A spare copy of the grid is given on page 15.

(3)

In part (b) you must show all stages of your working.

Solutions relying entirely on calculator technology are not acceptable.

(b) Determine the exact area enclosed between the two curves defined in part (a). (7)

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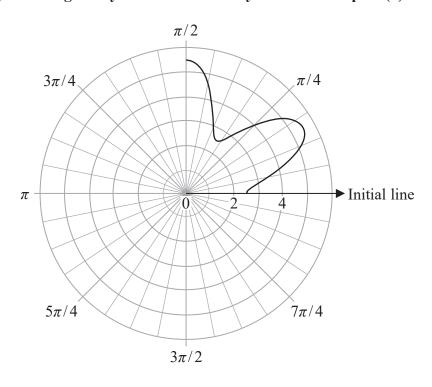


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Question 4 continued	

Question 4 continued	
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Only use this grid if you need to redraw your answer to part (a)



Copy of Figure 2

(Total 10 marks)



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(5)

(3)

- 5. $y = \sqrt{4 + \ln x}$ $x > \frac{1}{2}$
 - (a) Show that

$$\frac{d^2y}{dx^2} = -\frac{9 + 2\ln x}{4x^2(4 + \ln x)^{\frac{3}{2}}}$$

(b) Hence, or otherwise, determine the Taylor series expansion about x = 1 for y, in ascending powers of (x - 1), up to and including the term in $(x - 1)^2$, giving each coefficient in simplest form.



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- **6.** Given that A > B > 0, by letting $x = \arctan A$ and $y = \arctan B$
 - (a) prove that

$$\arctan A - \arctan B = \arctan\left(\frac{A - B}{1 + AB}\right)$$

(b) Show that when A = r + 2 and B = r

$$\frac{A-B}{1+AB} = \frac{2}{(1+r)^2}$$
 (2)

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

$$\sum_{n=1}^{n} \arctan\left(\frac{2}{(1+r)^2}\right) = \arctan(n+p) + \arctan(n+q) - \arctan 2 - \frac{\pi}{4}$$

where p and q are integers to be determined.

(4)

(3)

(d) Hence, making your reasoning clear, determine

$$\sum_{r=1}^{\infty} \arctan\left(\frac{2}{(1+r)^2}\right)$$

giving the answer in the form $k\pi$ – arctan 2, where k is a constant.

(2)



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Question 6 continued	

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Question 6 continued	

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	Q6
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7. A transformation from the z-plane to the w-plane is given by

$$w = \frac{(1+i)z + 2(1-i)}{z-i}$$
 $z \neq i$

The transformation maps points on the imaginary axis in the z-plane onto a line in the w-plane.

(a) Find an equation for this line.

(2)

The transformation maps points on the real axis in the z-plane onto a circle in the w-plane.

(b) Find the centre and radius of this circle.

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(4)

8. (a) Show that the transformation v = y - 2x transforms the differential equation

$$\frac{dy}{dx} + 2yx(y - 4x) = 2 - 8x^3$$
 (I)

into the differential equation

$$\frac{\mathrm{d}v}{\mathrm{d}x} = -2xv^2 \tag{II}$$

- (b) Solve the differential equation (II) to determine v as a function of x
- (c) Hence obtain the general solution of the differential equation (I). (1)
- (d) Sketch the solution curve that passes through the point (-1, -1).

On your sketch show clearly the equation of any horizontal or vertical asymptotes.

You do **not** need to find the coordinates of any intercepts with the coordinate axes or the coordinates of any stationary points.

(5)



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Question 8 continued