



Cambridge International Examinations

Cambridge International Advanced Subsidiary Level

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	
MATHEMATICS			9709/2
Paper 2 Pure Math	nematics 2 (P2)		February/March 201
			1 hour 15 minute
Candidates answer	r on the Question Paper.		
Additional Materials	s: List of Formulae (MF9)		

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** the questions in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.

Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.

The use of an electronic calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 50.



BLANK PAGE

		•••••	•••••			
•••••	•••••	•••••	•••••			
•••••	•••••••	•••••	••••••	•••••••		•
		•••••	•••••			
••••••	•••••	•••••	•••••	•••••	•••••	
		•••••				
•••••	•••••	•••••	•••••		•••••	•••••
		•				
			•••••			
		•••••	•••••	• • • • • • • • • • • • • • • • • • • •		
•••••	•••••	•••••	•••••	• • • • • • • • • • • • • • • • • • • •	•••••	••••••
	•••••					
•••••	••••••	•••••	•••••	• • • • • • • • • • • • • • • • • • • •	•••••	••••••

$x=\pi$.							
•••••	•••••	••••••		•••••	•••••	•••••	
••••••		•••••		•••••	••••••	•••••	
••••••	•••••	••••••	• • • • • • • • • • • • • • • • • • • •	••••••	• • • • • • • • • • • • • • • • • • • •	•••••	
		•••••					
••••••	•••••	•••••	• • • • • • • • • • • • • • • • • • • •	•••••	••••••	•••••	••••••
•••••		•••••		•••••		•••••	
•••••	••••••	••••••	• • • • • • • • • • • • • • • • • • • •	•••••	•••••	••••••	
•••••		•••••		•••••		•••••	
•••••		••••••		••••••	•	•••••	
•••••	•••••	•••••		•••••	•••••	•••••	
•••••				•••••		•••••	

(i) Use the trapezium rule with four intervals to find an approximation to

3

oriz.		$\int_0^8 \ln(x+2) \mathrm{d}x,$	
giv	ing your answer correct to 3	3 significant figures.	[3]
••••			
••••			
••••			
••••			
••••			
••••			
ii) Hei	nce find an approximation t	.0	
(ii) He	nce find an approximation t		[2]
(ii) Her	nce find an approximation t	$\int_0^8 3 \ln(x^2 + 4x + 4) \mathrm{d}x.$	[2]
ii) Her	nce find an approximation t		[2]
	nce find an approximation t		[2]
	nce find an approximation t		[2]
 	nce find an approximation t		
 	nce find an approximation t	$\int_0^8 3 \ln(x^2 + 4x + 4) \mathrm{d}x.$	
	nce find an approximation t	$\int_0^8 3 \ln(x^2 + 4x + 4) \mathrm{d}x.$	
	nce find an approximation t	$\int_0^8 3 \ln(x^2 + 4x + 4) \mathrm{d}x.$	

4 The polynomial $p(x)$ is defined	4	The po	lynomial	p(x)) is	defined	b
------------------------------------	---	--------	----------	------	------	---------	---

$$p(x) = 4x^3 + 4x^2 - 29x - 15.$$

(i)	Use the factor theorem to show that $(x + 3)$ is a factor of $p(x)$.	[2]
		•••••
(ii)	Factorise $p(x)$ completely.	[3]
		•••••
		•••••

/ • • • \	T T	•	. 1
(1111)	Hence,	OIVAN	that
\ 111 <i>1</i>	TICHCC,	211011	urai

$2^{3u+2} + 4^{u+1} = 29 \times 2^u + 15,$
find the value of 2^u and, using logarithms, find the value of u correct to 3 significant figures. [3]

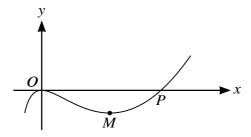
Show th	at $a = \frac{1}{2} \ln(12.5)$	$5 + e^{-4a}$).				
••••••				•••••		
						•••••
••••••		••••••	••••••	•••••		•••••
	••••••	••••••	••••••	•••••	•••••••••••••••••••••••••••••••••••••••	•••••
•••••	•••••			•••••	•••••••••••	
•••••						
					•••••••••••••••••••••••••••••••••••••••	
					•••••	
•••••	•••••	••••••	•••••••	•••••	••••••••••••	••••••
•••••		•••••		•••••		•••••

(ii)	Use the equation in part (i) to show by calculation that $1.0 < a < 1.5$.	[2]
		•••••
		•••••
		•••••
		•••••
(*** <u>)</u>		
(111)	Use an iterative formula based on the equation in part (i) to find the value of a co 4 significant figures. Show the result of each iteration to 6 significant figures.	rrect to [3]
		[-]
		•••••
		••••••
		•••••
		•••••

•	 •••••
•	
•	
•	•••••
•	
•	
•	
•	

(ii)	Hence find the exact value of $\cot \frac{1}{12}\pi$.	[2]
(iii)	Find $\int \sin 2x (\csc 4x + \cot 4x) dx$.	[3]
		••••••

7



The diagram shows part of the curve defined by the parametric equations

$$x = t^2 + 4t$$
, $y = t^3 - 3t^2$.

The curve has a minimum point at M and crosses the x-axis at the point P.

(i)	Find the gradient of the curve at <i>P</i> .	[4]
		•••••

(ii)	Find the coordinates of the point M .	[3]
		••••••
(iii)	The value of the gradient of the curve at the point with parameter t is denoted by m . Show	v that
	$3t^2 - (2m+6)t - 4m = 0$	
	and hence find the set of possible values of m for points on the curve.	[4]
		•••••

 ••••••
 •••••
••••••
 ••••••
•••••
 ••••••
 •••••
••••••
 ••••••
•••••
•••••
 •••••

Additional Page

If you use the following lined page to complete the answer(s) to any question(s), the question number(s) must be clearly shown.				

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.