



Cambridge Assessment International Education

Cambridge International Advanced Subsidiary Level

CANDIDATE NAME						
CENTRE NUMBER				CANDIDATE NUMBER		
MATHEMATICS						9709/23
Paper 2 Pure M	athematics	2 (P2)			Ма	y/June 2019
					1 hou	r 15 minutes
Candidates answ	ver on the	Question F	Paper.			
Additional Materials: 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.

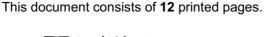
The use of an electronic calculator is expected, where appropriate.

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.





1	The po	lynomial	p(x)	is	defined	by

$p(x) = 4x^3 + (k+1)x^2 - mx + 3k,$					
where k and m are constants. Given that $(x + 1)$ is a factor of $p(x)$, express m in terms of k . [3]					

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2	(i)	Solve the equation $ 4 + 2x = 3 - 5x $.	[3]
((ii)	Hence solve the equation $ 4 + 2e^{3y} = 3 - 5e^{3y} $, giving the answer correct to 3 s	ignificant figures. [2]

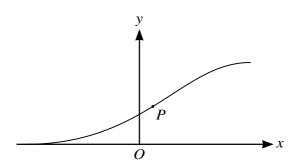
rina tne	e exact co	ordinates	or the sta	tionary	point of	tne cur	ve with	equatio	on $y = \frac{1}{1}$	$\overline{\mathbf{n}x}$.	
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	€ 8
	Use the trapezium rule with two intervals to find an approximation to $\int_{2}^{8} \sqrt{\ln(1+x)} dx$. [3]

(1)	Find the quotient and remainder when $2x^3 + x^2 - 8x$ is divided by $(2x + 1)$.	[3]
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(ii)	Hence find the exact value of $\int_0^3 \frac{2x^3 + x^2 - 8x}{2x + 1} dx$, giving the answer in the form $\ln(ke^a)$ where k and a are constants
	k and a are constants. [5]

6



The diagram shows the curve with parametric equations

$$x = 3t - 6e^{-2t}, \quad y = 4t^2e^{-t},$$

for $0 \le t \le 2$. At the point *P* on the curve, the *y*-coordinate is 1.

(i)	Show that the value of t at the point P satisfies the equation $t = \frac{1}{2}e^{\frac{1}{2}t}$.	[2]
	. 1.	
(ii)	Use the iterative formula $t_{n+1} = \frac{1}{2}e^{\frac{1}{2}t_n}$ with $t_1 = 0.7$ to find the value of t at P correct to 3 significants. Give the result of each iteration to 5 significant figures.	gnificant [3]
(ii)	Use the iterative formula $t_{n+1} = \frac{1}{2}e^{\frac{\pi}{2}t}$ with $t_1 = 0.7$ to find the value of t at P correct to 3 significant. Give the result of each iteration to 5 significant figures.	[3]
(ii)	figures. Give the result of each iteration to 5 significant figures.	[3]
(ii)	figures. Give the result of each iteration to 5 significant figures.	[3]
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(iii)	Find the gradient of the curve at P , giving the answer correct to 2 significant figures. [5]

7	(a)	(i)	Express $4 \sin \theta + 4 \cos \theta$ in the form $R \sin(\theta + \alpha)$, where $R > 0$ and $0^{\circ} < \alpha < 90^{\circ}$. [3]
		(ii)	Hence find the smallest positive value of θ satisfying the equation $4 \sin \theta + 4 \cos \theta = 5$. [2]

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(b) Solve the equation

$4\cot 2x = 5 + \tan x$

for $0 < x < \pi$, showing all necessary working and giving the answers correct to 2 decimal	places. [6]
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Additional Page

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