

Cambridge International AS & A Level

CANDIDATE NAME					
CENTRE NUMBER		CANDIDATE NUMBER			
MATHEMATIC	cs		9709/33		
Paper 3 Pure M	Mathematics 3	October/November 2020			
			1 hour 50 minutes		
You must answ	er on the question paper.				
You will need:	List of formulae (MF19)				

INSTRUCTIONS

- Answer all questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do not use an erasable pen or correction fluid.
- Do not write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [].

This document has **20** pages. Blank pages are indicated.

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1

Solve the inequality $2 - 5x > 2 x - 3 $.	[4
	•••••

On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z| \ge 2$ and $|z - 1 + i| \le 1$. [4]

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3

The parametric equations of a curve are					
$x = 3 - \cos 2\theta, y = 2\theta + \sin 2\theta,$					
for $0 < \theta < \frac{1}{2}\pi$.					
Show that $\frac{dy}{dx} = \cot \theta$. [5]					

Solve		

$\log_{10}(2x+1) = 2\log_{10}(x+1) - 1.$					
Give your answers correct to 3 decimal places.	[6]				

5 (a)	By sketching a suitable pair of graphs, show that the equation $\csc x$ roots in the interval $0 < x < \pi$.	$= 1 + e^{-\frac{1}{2}x} \text{ has exactly two}$ [2]				
(b)	The sequence of values given by the iterative formula					
	$x_{n+1} = \pi - \sin^{-1}\left(\frac{1}{e^{-\frac{1}{2}x_n} + 1}\right),$					
	with initial value $x_1 = 2$, converges to one of these roots.					
	Use the formula to determine this root correct to 2 decimal places.	Give the result of each				
	iteration to 4 decimal places.	[3]				
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6	(a)	Express $\sqrt{6}\cos\theta + 3\sin\theta$ in the form $R\cos(\theta - \alpha)$, where $R > 0$ and $0^{\circ} < \alpha < 90^{\circ}$. State the exvalue of R and give α correct to 2 decimal places.	act [3]
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7	(a)	Verify that $-1 + \sqrt{5}i$ is a root of the equation $2x^3 + x^2 + 6x - 18 = 0$.	[3]
			•••••

(b)	Find the other roots of this equation.	[4]

8	The coordinates	(x, y) of	a general point	of a curve satisfy	the differential	equation
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$$x\frac{\mathrm{d}y}{\mathrm{d}x} = (1 - 2x^2)y,$$

for x > 0. It is given that y = 1 when x = 1.

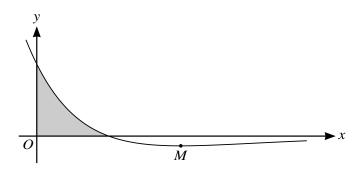
Solve the differential equation, obtaining an expression for y in terms of x .	[6]
	••••••

,
•••••

9	Let	$f(x) = \frac{8 + 5x + 12x^2}{(1 - x)(2 + 3x)^2}.$
		Express $f(x)$ in partial fractions. [5]

b)	Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

10



The diagram shows the curve $y = (2 - x)e^{-\frac{1}{2}x}$, and its minimum point M.

(a)	Find the exact coordinates of M .	[5]

(b)	Find the area of the shaded region bounded by the curve and the axes. of e.	Give your answer in terms [5]

11	Two lines have equations $\mathbf{r} = \mathbf{i} + 2\mathbf{j} + \mathbf{k} + \lambda(a\mathbf{i} + 2\mathbf{j} - \mathbf{k})$ and $\mathbf{r} = 2\mathbf{i} + \mathbf{j} - \mathbf{k} + \mu(2\mathbf{i} - \mathbf{j} + \mathbf{k})$, where a is a constant.		
	(a)	Given that the two lines intersect, find the value of a and the position vector of the point of intersection. [5]	

two possible values of a.	[6

Additional Page

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