

Cambridge International AS & A Level

CANDIDATE NAME									
CENTRE NUMBER					CANDIDATE NUMBER				
MATHEMATIC	cs							970	9/12
Paper 1 Pure M	1athen	natics	s 1				May/	June :	2020
						1 h	our 5	0 min	utes

You must answer 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 16 pages. Blank pages are indicated.

(a)	Find the coefficient of x^2 in the expansion of $\left(x - \frac{2}{x}\right)^6$.	[2]
(b)	Find the coefficient of x^2 in the expansion of $(2 + 3x^2) \left(x - \frac{2}{x}\right)^6$.	[3]

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(b)	Hence find the acute angle, in degrees, for which $3\cos\theta = 8\tan\theta$.	
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(b)		

3

(a)	Find the radius of the balloon after 30 seconds.
(b)	
	Find the rate of increase of the radius after 30 seconds.
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Find the value of	<i>n</i> for which the su	n of the first n term	ns is 84.	
				······

	5	The	func	tion	f	is	define	d	for	x	\in	\mathbb{R}	by
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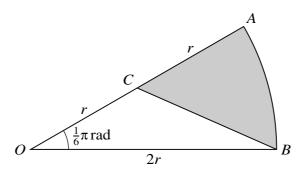
 $f: x \mapsto a - 2x$,

where a is a constant.

	Express $ff(x)$ and $f^{-1}(x)$ in terms of a and x .	[4]
(b)	Given that $ff(x) = f^{-1}(x)$, find x in terms of a.	[2]
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(b)		
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6

Given that the line $y = 2x + 3$ is a tangent to the curve, find the value of k .	[3
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now given that $k = 2$.	
Express the equation of the curve in the form $y = 2(x + a)^2 + b$, where a and b are constants, hence state the coordinates of the vertex of the curve.	and [3
Express the equation of the curve in the form $y = 2(x + a)^2 + b$, where a and b are constants,	
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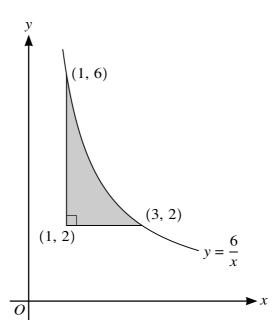
In the diagram, OAB is a sector of a circle with centre O and radius 2r, and angle $AOB = \frac{1}{6}\pi$ radians. The point C is the midpoint of OA.

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,	Find the exact perimeter of the shaded region.
	Find the exact area of the shaded region.
	Find the exact area of the shaded region.
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8

(a)



The diagram shows part of the curve $y = \frac{6}{x}$. The points (1, 6) and (3, 2) lie on the curve. The shaded region is bounded by the curve and the lines y = 2 and x = 1.

Find the volume generated when the shaded region is rotated through 360° about the y-axis . [5]

line $y = 2x$.	[
	 •••••

9 Functions f and g are such that

$$f(x) = 2 - 3\sin 2x \text{ for } 0 \le x \le \pi,$$

$$g(x) = -2f(x) \text{ for } 0 \le x \le \pi.$$

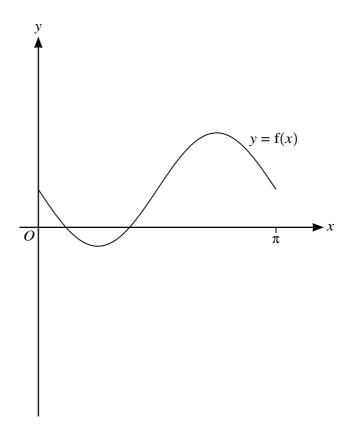
(a) State the ranges of f and g.

[3]



.....

The diagram below shows the graph of y = f(x).



(b) Sketch, on this diagram, the graph of y = g(x). [2]

The function h is such that

$$h(x) = g(x + \pi) \text{ for } -\pi \le x \le 0.$$

(c)	Describe fully a sequence of transformations that maps the curve $y = f(x)$ on to $y = h(x)$.	[3]

10	The equation of a curve is $y = 54x - (2x - 7)^3$.	
	(a) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.	[4]

Find the coordinates of each of the stationary points on the curve.	[3]
	•••••

(b)

(c)	Determine the nature of each of the stationary points.	[2]
		••••
		••••

(a)	Find the radius of the circle and the coordinates of C .	[3]
The	e point $P(1, 2)$ lies on the circle.	
	e point $P(1, 2)$ lies on the circle. Show that the equation of the tangent to the circle at P is $4y = 3x + 5$.	[3]
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The point Q also lies on the circle and PQ is parallel to the x-axis.

(c)	Write down the coordinates of Q .	[2]
		••••••
The	tangents to the circle at P and Q meet at T .	
(d)	Find the coordinates of T .	[3]

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.

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