Please check the examination details belo	ow before ente	ring your candidate information
Candidate surname		Other names
Centre Number Candidate Number Pearson Edexcel Interior		al Advanced Level
Thursday 18 January	y 2024	1
Morning (Time: 1 hour 30 minutes)	Paper reference	WMA14/01
Mathematics International Advanced Le Pure Mathematics P4	evel	♦ ♦
You must have: Mathematical Formulae and Statistical	Tables (Yell	low), calculator

Candidates may use any calculator permitted 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 9 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 question 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.

 Turn over





1.	Find, in ascending powers of x up to and including the term in x^3 , the binomial
	expansion of

$$|x| < \frac{1}{4}$$

fully simplifying each term.		

fully simplifying each term.	(4)
	(4)

$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$

\times
\times
× • • ×
$\times \infty$
\times
$\times \times \times \times$
\times
\times
$\otimes \times \times \otimes$
\times
\times
WRITE
∞
\times

$\times = \times \times$
∞
\times
$\times \bigcirc \times$
$\times\!\!\times\!\!\times\!\!\times$
\times

$\times\!\!\times\!\!\times\!\!\times$
XXXXX
\times

$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$

XXXX
$\times\!\!\times\!\!\times\!\!\times$
\longleftrightarrow
$\times\!\!\times\!\!\times\!\!\times$

$\times\!\!\times\!\!\times\!\!\times$
$\otimes $
\times
\times
\times

∞ ω ∞
XX XX XX
差 ※
王
吾
T
THE N
IN THI
E IN THI
TE IN THI
ITE IN THI
RITE IN THI
/RITE IN THI
WRITE IN THI
WRITE IN THI
T WRITE IN THI
OT WRITE IN THI
OT WRITE IN THI
NOT WRITE IN THI
NOT WRITE IN THI
NOT WRITE IN T
O NOT WRITE IN TH
NOT WRITE IN T
O NOT WRITE IN TH
DO NOT WRITE IN TH
O NOT WRITE IN TH
EA DO NOT WRITE IN TH
EA DO NOT WRITE IN TH
REA DO NOT WRITE IN TH
EA DO NOT WRITE IN TH
AREA DO NOT WRITE IN TI
AREA DO NOT WRITE IN TI
REA DO NOT WRITE IN TH
IS AREA DO NOTWRITE IN TI
IN THIS AREA DO NOT WRITE IN TH
IN THIS AREA DO NOT WRITE IN TH
E IN THIS AREA DO NOT WRITE IN TH
IN THIS AREA DO NOT WRITE IN TH
E IN THIS AREA DO NOT WRITE IN TH
E IN THIS AREA DO NOT WRITE IN TH
E IN THIS AREA DO NOT WRITE IN TH
E IN THIS AREA DO NOT WRITE IN TH
E IN THIS AREA DO NOT WRITE IN TH
E IN THIS AREA DO NOT WRITE IN TH
E IN THIS AREA DO NOT WRITE IN TH
E IN THIS AREA DO NOT WRITE IN TH
E IN THIS AREA DO NOT WRITE IN TH
NOT WRITE IN THIS AREA DO NOT WRITE IN TH
E IN THIS AREA DO NOT WRITE IN TH
NOT WRITE IN THIS AREA DO NOT WRITE IN TH
NOT WRITE IN THIS AREA DO NOT WRITE IN TH
NOT WRITE IN THIS AREA DO NOT WRITE IN TH

Question 1 continued	
(Total for Question 1 is 4 marks)	
(20mi 101 Question 2 is 1 marks)	



2. Given that

$$\frac{3x+4}{(x-2)(2x+1)^2} \equiv \frac{A}{x-2} + \frac{B}{2x+1} + \frac{C}{(2x+1)^2}$$

(a) find the values of the constants A, B and C.

(4)

(b) Hence find the exact value of

$$\int_{7}^{12} \frac{3x+4}{(x-2)(2x+1)^2} \, \mathrm{d}x$$

giving your answer in the form $p \ln q + r$ where p, q and r are rational numbers.

(6)

-		

$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
DO NOT WRITE IN THIS AREA
\times MM \times
× 700
XX X 2 X
$\times\!\!\times\!\!\times\!\!\times$
\propto ω
\times
$\times\!\times\!\times\!\times$
\times
$\otimes \bowtie$
\times
\times
$\times \circ \times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\langle \rangle \rangle \langle \rangle \langle$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\langle \rangle \rangle \langle \rangle \langle$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
X OZ
$\times \times \times$
$\times \Delta$
XXXXX
Z
Z
Z
N E I N
TEIN
RITE IN
RITEIN
WRITE IN
WRITEIN
WRITE IN
T WRITE IN
OT WRITE IN
IOT WRITE IN
NOT WRITE IN
NOT WRITE IN THIS AREA
D NOT WRITE IN
∞
DO NOT WRITE IN
∞
00
4 DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
AREA DO
4 DO

Question 2 continued	



Question 2 continued	
	_
	_
	_
	_

\times
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
⋖
₩ ₩
ARE
× vo
HIS
$\otimes \overline{\otimes} \otimes$
₩.
$\otimes \bowtie \otimes$
×O:
\times 9 \times
DO NOT WRI
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$

$\times\!\!\times\!\!\times\!\!\times$
et.
<u> </u>
W K
<u>v</u>
\otimes
\otimes
Z
Z
E IN T
NOTWRITEINT
NOTWRITEINT
O NOT WRITE IN T
DO NOT WRITE IN T
DO NOT WRITE IN T
DO NOT WRITE IN T
DO NOT WRITE IN T
DO NOT WRITE IN T
DO NOT WRITE IN T
DO NOT WRITE IN T
DO NOT WRITE IN T
DO NOT WRITE IN T
DO NOT WRITE IN T
DO NOT WRITE IN T
DO NOT WRITE IN T
DO NOT WRITE IN T
A DO NOT WRITE IN T
A DO NOT WRITE IN T
REA DO NOT WRITE IN T
AREA DO NOT WRITE IN T
S AREA DO NOT WRITE IN T
IS AREA DO NOT WRITE IN T
HIS AREA DO NOT WRITE IN T
THIS AREA DO NOT WRITE IN T
N THIS AREA DO NOT WRITE IN T
IN THIS AREA DO NOT WRITE IN T
E IN THIS AREA DO NOT WRITE IN T
E IN THIS AREA DO NOT WRITE IN T
RITE IN THIS AREA DO NOT WRITE IN T
VRITE IN THIS AREA DO NOT WRITE IN T
WRITE IN THIS AREA DO NOT WRITE IN T
I WRITE IN THIS AREA DO NOT WRITE IN T
OT WRITE IN THIS AREA DO NOT WRITE IN T
NOT WRITE IN THIS AREA DO NOT WRITE IN T
NOT WRITE IN THIS AREA DO NOT WRITE IN T
NOT WRITE IN THIS AREA DO NOT WRITE IN T
O NOT WRITE IN THIS AREA DO NOT WRITE IN T

Question 2 continued	
(Total	for Question 2 is 10 marks)



3.

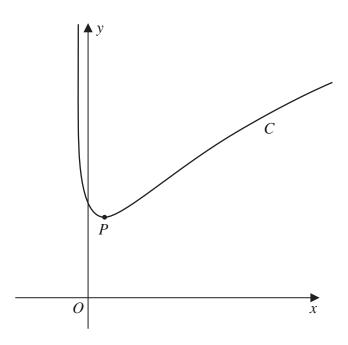


Figure 1

The curve C, shown in Figure 1, has equation

$$y^2x + 3y = 4x^2 + k \qquad y > 0$$

where k is a constant.

(a) Find $\frac{dy}{dx}$ in terms of x and y

(5)

The point P(p, 2), where p is a constant, lies on C.

Given that P is the minimum turning point on C,

- (b) find
 - (i) the value of p
 - (ii) the value of k

(4)

(××××
$\times\!\!\times\!\!\times$
>>>>
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
INTHIS AREA
· 67
$\times \times \times \times$
× LO
\times
WRITE
800
×5
\times
$\times 2$
\times
DO NOT
$\times \square$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
XXXX
>>>>
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times\!\!\times$

>>>>>
$\times\!\!\times\!\!\times$
>>>>
\times
AREA
× na×
=
ŧ
N THE
IN THIS
E IN THE
ITE IN THE
RITE IN THE
VRITE IN THE
WRITE IN THE
T WRITE IN THE
OT WRITE IN THE
JOT WRITE IN THE
NOT WRITE
NOT WRITE
NOT WRITE
DO NOT WRITE IN THE
NOT WRITE
DO NOT WRITE
DO NOT WRITE
DO NOT WRITE
DO NOT WRITE
DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
RITE IN THIS AREA DO NOT WRITE
RITE IN THIS AREA DO NOT WRITE
WRITE IN THIS AREA DO NOT WRITE
WRITE IN THIS AREA DO NOT WRITE
WRITE IN THIS AREA DO NOT WRITE
WRITE IN THIS AREA DO NOT WRITE
NOT WRITE IN THIS AREA DO NOT WRITE
WRITE IN THIS AREA DO NOT WRITE

Question 3 continued



Question 3 continued

	(
	· `
_ XXXXXX	
_ XXXXXX	_
4	
1	
- CO 24 CO	
<u></u>	-
×vo×	
- XX XX XX	_
- XX XX XX	
- X X	
	_
	_
_ XX ® XXXX	
XX VX XXX	
\times 0C \times	
	_
	_
- XX	
×o×	_
	_
	_
	_

	-
- XXXXXXX	
4	
CXXXXXX	
0.00	
02	
- XXX X XXX	
<u>S</u>	
- X X	
T	
	_
Z	-
Z	-
E IN	-
TE IN	-
E IN	 - -
TE IN	 - -
TE IN	 -
TE IN	-
/RITE IN]	-
WRITEINT	 -
TWRITEINT	 - -
TWRITEINT	-
OT WRITE IN T	-
OT WRITE IN T	-
NOT WRITE IN 1	-
OT WRITE IN T	-

/			7	
			>	
2	۱	j,	۲.	/
			1	١,
			>	C
)	۲		۲.	2
١.			/	١,
			>	
	Κ		≺	>
		۲	7	
K	٦		>	
	ĸ			×
Κ		٩	2	
/			1	
				۷
Κ,	a	ø	ĺ	₹.
J	ξ	S	2	2
)		3	₹	9
ĸ	ø	Ť		ø
А	ь	a	ь	a
				3
×i	Р	٩	ø	e.
А	ь	d	ь	ď
	7	2		Z
		á	ø	ĸ
Э		S	31,	
×	2	₹	ş	۹.
ď	١	2	1	
٦	ú	٦	яÌ	ĸ.
×	k		r	9
/	₹	7	×	7
N	н	ь	ы	ĸ.
Κ,	_	4	_	4
. 2	₹	3	r	~
٦	2		Ľ	₹.
e.	-	۰	7	е.
2	E.	2		
N	r	۰	7	۰
А	в,	7	/	
	4		∠	
	7	٠		μ
Ĵ,	ы	e	Š	
Ŋ	۳	۰	۰	۹,
4	è	ú	è	ú
	7		7	7
1	2	S	7	7
KI	b	4	ļ	я
а				ø
'n	۳	٦	7	١.
И	B	×	×	Ħ.
ø	К			
Š	ė	ь	a	'n.
2	Z	Z		Z
7	۲	٦	۴	٠,
×			bì	á.
	S	2	1	2
Ŋ	,	•	Sign (è
Ý	ń	e	9	۳
.2	4	혓	3	ď
A	ø	Ħ	7	4
			>	C
J	ĸ	2	S	2
N	۲	8	۳	۹
ð	٩,	2	2	
à	ø	н	ч	ĸ
ч	ĸ		2	20.
2	۹	N		۴
1	4	š	4	۷.
ď	7	z	a	۴
d			٤.	ď
1	7	٦	7	₹,
×			>	0
	á	ø	á	è
ч	۲	ς	2	Ħ.
2	٩	ú	ä	ħ,
	C		z	
K	ø	۴	9	ĸ.

Question 3 continued	
(То	tal for Question 3 is 9 marks)



4.

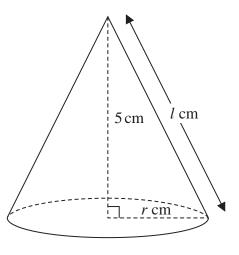


Figure 2

A cone, shown in Figure 2, has

- fixed height 5 cm
- base radius *r* cm
- slant height *l* cm
- (a) Find an expression for l in terms of r

(1)

Given that the base radius is increasing at a constant rate of 3 cm per minute,

(b) find the rate at which the total surface area of the cone is changing when the radius of the cone is 1.5 cm. Give your answer in cm² per minute to one decimal place.

[The total surface area, S, of a cone is given by the formula $S = \pi r^2 + \pi r l$]

(4)



Question 4 continued	
(Total	for Question 4 is 5 marks)
(Total	101 Question 7 is 5 marks)



5. (a) Find $\int x^2 \cos 2x \, dx$

(4)

(b) Hence solve the differential equation

$$\frac{\mathrm{d}y}{\mathrm{d}t} = \left(\frac{t\cos t}{y}\right)^2$$

giving your answer in the form $y^n = f(t)$ where n is an integer.

(5)

Question 5 continued



Question 5 continued	

Question 5 continued
(Total for Question 5 is 9 marks)



6. Relative to a fixed origin O, the lines l_1 and l_2 are given by the equations

$$l_1$$
: $\mathbf{r} = (3\mathbf{i} + p\mathbf{j} + 7\mathbf{k}) + \lambda(2\mathbf{i} - 5\mathbf{j} + 4\mathbf{k})$

$$l_2: \mathbf{r} = (8\mathbf{i} - 2\mathbf{j} + 5\mathbf{k}) + \mu(4\mathbf{i} + \mathbf{j} + 2\mathbf{k})$$

where λ and μ are scalar parameters and p is a constant.

Given that l_1 and l_2 intersect,

(a) find the value of p,

(4)

(b) find the position vector of the point of intersection.

(2)

(c) Find the acute angle between l_1 and l_2

Give your answer in degrees to one decimal place.

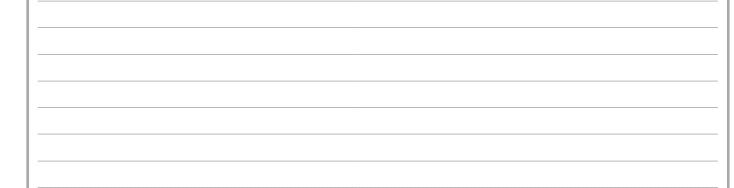
(3)

The point A lies on l_1 with parameter $\lambda = 2$

The point B lies on l_2 with \overrightarrow{AB} perpendicular to l_2

(d) Find the coordinates of B

(5)



Question 6 continued



Question 6 continued				

Question 6 continued	
(To	etal for Question 6 is 14 marks)



7. (a) Using the substitution $u = 4x + 2\sin 2x$, or otherwise, show that

$$\int_0^{\frac{\pi}{2}} e^{4x + 2\sin 2x} \cos^2 x \, dx = \frac{1}{8} (e^{2\pi} - 1)$$

(5)

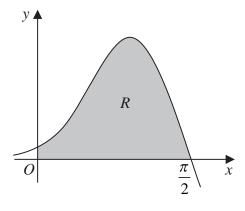


Figure 3

The curve shown in Figure 3, has equation

$$y = 6e^{2x + \sin 2x} \cos x$$

The region R, shown shaded in Figure 3, is bounded by the positive x-axis, the positive y-axis and the curve.

The region R is rotated through 2π radians about the x-axis to form a solid.

(b) Use the answer to part (a) to find the volume of the solid formed, giving the answer in simplest form.

(3)

>>>>
$\times\!\!\times\!\!\times$

>>>>
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
INTHIS AREA
02
× vs
XXXX
$\times \overline{\infty}$
\times
RITE
3
NOT
\sim
\otimes
00
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$

$\times\!\!\times\!\!\times$
>>>
>>>>

>>>>
$\times\!\!\times\!\!\times$
$\times\!\!\times\!\!\times$
>>>>
$\times\!\!\times\!\!\times$
\times m
× OZ
AREA
$\sim\sim$
\times
皇
Ī
E
THE R
IN THIS
TEIN THE
ITE IN THE
RITE IN THE
VRITE IN THE
WRITE IN THE
T WRITE IN THE
OT WRITE IN THE
JOT WRITE IN THE
NOT WRITE
NOT WRITE
NOT WRITE
DO NOT WRITE IN THI
NOT WRITE
DO NOT WRITE
DO NOT WRITE
DO NOT WRITE
DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
AREA DO NOT WRITE
RITE IN THIS AREA DO NOT WRITE
RITE IN THIS AREA DO NOT WRITE
WRITE IN THIS AREA DO NOT WRITE
WRITE IN THIS AREA DO NOT WRITE
WRITE IN THIS AREA DO NOT WRITE
WRITE IN THIS AREA DO NOT WRITE
NOT WRITE IN THIS AREA DO NOT WRITE
NOT WRITE IN THIS AREA DO NOT WRITE
WRITE IN THIS AREA DO NOT WRITE

Question 7 continued	



Question 7 continued

×
×>
\otimes
X
\otimes
X.
X
X
X
$\langle \rangle$
×
\sim
\otimes
X
X
×
X
X
X
×
\sim
×
X
×
X
X
X
×
$\stackrel{\times}{\sim}$
××
X
X
X
X
×
$\times \!\!\! >$
$\times \!\! >$
X
×
×
X
X
× ×
$\stackrel{\checkmark}{>}$
\Rightarrow
X
X
X.
X
X
X
$\stackrel{\checkmark}{\sim}$
\times
\otimes
×
X.
X
X
X
X
\Rightarrow
$\stackrel{\wedge}{>}$
X
X
X
X
X
Ø
\otimes
V V
\times
\propto
\otimes
$\stackrel{\times}{\times}$
× ×
× ×
*
× × ×
× × ×
× × ×

×				<		
\wedge	l			١,		
X						
V	Υ,			2	S	
	Κ)		
A	2	5		٩		
		⋖		K		
8	۲					
	K					3
X	2	ς	d	μ		P
		ð	9	ч		ś
	Κ	2	S	2		3
0		Я	Ľ	3	Ľ	
X		Q	9	ę	9	۹
8		4	ρ	Ŋ	à	ø
		J	S	a	G	ė
\triangle	Z	1	7	7	Z	2
×		4	à	ø		9
\vee	١.	ð	۹	Þ		ú
0	Κ					
$^{\sim}$	2	۱	ź	S	á	٤
		d	D.	а	r	
V	S	2	7	7		2
8	≺	y	ę	9	ę	۰
X	2	9	ú	ú	Ď	ú
				4		
	K	a	á		Ľ,	Ė
8	Z	'n	ď			
X		1	P	۹	ņ	8
×	١.	ð	٩,			
	K	à	4	2	≤	i
	2		Z	2	7	
×		ì		G	ò	ú
V	S	2	2	Z	Z	é
	K	3	₹	7	₹	7
ŏ	Ü	1	2	S		ì
		d	b	4	Ĺ	
V	ĸ	2	۹	7	٩	ę
	K	d	Ľ	2	≤	ì
×)	q	r	٠	7	۹
X		Ġ	ì	4	_	2
C	Κ	2	₹	7	₹	7
	ď.	Y	ρ	٩	ø	9
X		4			В	á
V	١.	4	S	2		
	K	4	S	3		ś
\wedge	Z	У	я		Z	è
		3	à	á	ø	ø
×	١	2		2		
	K	J	Ľ	2	S	ì
\triangle	1	١	۲	٩	۲	٩
8		C	ā	ú	è	ś
×		d	r		3	
	Κ	9	٩	ù	й	ø
\wedge	1	١	2	Σ	Z	2
		C	7	S	a	ę
\vee	۲	à		S	è	ú
	K					
\wedge	2	۱	2	S	ż	
		4	۲	₹	7	
V	Κ	λ	ĕ	2	S	d
	K		ĝ		ď	
X	2	Ý	ø	₹	7	ŧ
	>	d	Ŀ	4	4	
	Κ	2	₹	7	₹	7
	ď	5		1		
		≺		Κ		
×	5	2				
	K					
A	2	1		5	2	
				<		

Question 7 continued				
(Total for Question 7 is	8 marks)			



has no stationary points. $ (4) $	3.	3. Use proof by contradiction to prove that the curve with equation				
has no stationary points. (4)		$y = 2x + x^3 + \cos x$				
		has no stationary points.		(4)		

$\langle \times \rangle$	\times	
\propto	$\times\!\!\times\!\!\!\times$	
22	VV.	
22	V.	
\times	\sim	
\times	$\Diamond \Diamond$	
X	$\Diamond \Diamond$	
V.	\sim	
X	$\times\!\!\times$	
	XX	
$\langle \times \rangle$	$\times\!\!\times\!\!\!\times$	
\propto	$\times \times$	
\times	\sim	
\times	$\langle \rangle \langle \rangle$	
\times	⋖	
X	S	
SS	$\Delta \Sigma$	
W	ЫМ	
O.	22	
ZΜ		
χı	X X	
\times	⋖	
X	94	
X	$\circ \circ$	
SYI	S	
$\langle \times \rangle$	Μ.	
(XI	inipid,	
Ċά		
Œ,	M V	
22	$\times \times$	
XI	-	
X	\vee	
\times		
X	_	
X.	∞	
W		
×	XX	
O/I	ш	
Ćά	DXX	
M	77	
8		
×	9	
XI		
X		
X		
Ç4	-	
⊘á	-	
8	XX	
XI	1	
X	SO.	
Χũ		
X	0	
X		
V.		
X.	$\overline{}$	
$\langle \times \rangle$	\sim	
$\langle \times $		
X	~	
\times_{λ}	~	
X	$_{\infty}$	
X	∞	
S	\sim	
VX.	$\times \times$	
V.	$\times \times$	
×	$\times \times$	
\propto		
\sim	$\vee \vee$	
$\times \rangle$	$\langle \rangle \rangle$	
$\times \rangle$	\sim	
	$\circ \circ$	
S	$\Diamond \Diamond$	
\otimes	\otimes	
\otimes	\otimes	
8	\otimes	
8	$\overset{\times}{\otimes}$	
× ×	*	
× ×	*	
× ×	*	
× ×		
	EA	
	SEA SEA	
8		
8		
8		
	SAKE	
	SAKE	
	IS ARE	
	NATION AND AND AND AND AND AND AND AND AND AN	
	NATION AND AND AND AND AND AND AND AND AND AN	
	NATION AND AND AND AND AND AND AND AND AND AN	
	NATION AND AND AND AND AND AND AND AND AND AN	
	NATION AND AND AND AND AND AND AND AND AND AN	
	NATION AND AND AND AND AND AND AND AND AND AN	
	NATION AND AND AND AND AND AND AND AND AND AN	
	WRITEINITEINAR	
	NOT WRITE IN THIS ARE	
	NOT WRITE IN THIS ARE	
	NOT WRITE IN THIS ARE	
	NOT WRITE IN THIS ARE	
	NOT WRITE IN THIS ARE	
	NOT WRITE IN THIS ARE	
	NOT WRITE IN THIS ARE	
	WRITEINITEINAR	
	NOT WRITE IN THIS ARE	
	NOT WRITE IN THIS ARE	
	NOT WRITE IN THIS ARE	
	NOT WRITE IN THIS ARE	
	NOT WRITE IN THIS ARE	
	NOT WRITE IN THIS ARE	
	NOT WRITE IN THIS ARE	

(Total for Duration 8 is A marks)	Question 8 continued				
(Tatel for Dusstian S is A marks)					
(Datal for Ounction S is 4 marks)					
(Total for Quartian \$ is 4 marks)					
(Total for Operation 8 is 4 montrs)					
(Total for Onaction 8 is 4 montre)					
(Total for Questian S is 4 marks)					
(Total for Question 8 is 4 marks)					
(Total for Question 8 is 4 marks)					
(Tatal for Question 8 is 4 marks)					
(Total for Question 8 is 4 marks)					
(Total for Question 8 is 4 marks)					
(Total for Question 8 is 4 marks)					
(Total for Quartien 8 is 4 marks)					
(Total for Question 8 is 4 marks)					
(Total for Question 8 is 4 marks)					
(Total for Quaction 8 is 4 marks)					
(Tatal for Question & is 4 marks)					
(Total for Question 8 is 4 marks)					
(Total for Question 8 is 4 marks)					
(Total for Question 8 is 4 marks)					
(Total for Question & is 4 marks)					
(Total for Question & is 4 marks)					
(Total for Question & is 4 marks)					
(Total for Question & is 4 marks)					
(Total for Question & is 4 marks)					
(Total for Question 6 is 4 marks)	(Total for	Question 8 is 4 marks)			



9.

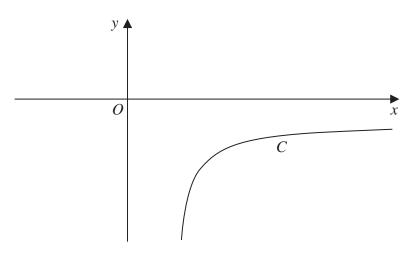


Figure 4

Figure 4 shows a sketch of the curve C with parametric equations

$$x = \sec t$$
 $y = \sqrt{3} \tan \left(t + \frac{\pi}{3}\right)$ $\frac{\pi}{6} < t < \frac{\pi}{2}$

(a) Find $\frac{dy}{dx}$ in terms of t

(3)

(b) Find an equation for the tangent to C at the point where $t = \frac{\pi}{3}$

Give your answer in the form y = mx + c, where m and c are constants.

(4)

(c) Show that all points on C satisfy the equation

$$y = \frac{Ax^2 + B\sqrt{3x^2 - 3}}{4 - 3x^2}$$

where *A* and *B* are constants to be found.

(5)

Question 9 continued	



Question 9 continued		

Question 9 continued		



Question 9 continued	
	(Total for Question 9 is 12 marks)
	TOTAL FOR PAPER IS 75 MARKS

