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Solution	Marks	notes
1. $(1+2\pi)^3(1+3x)^4 = (1+6x+12x^2+)(1+12x+54x^2+$) 2A+IA	[24 for 1st correct
$= (1 + 18x + 138x^{2} + \dots)$	2.A	repansion (3 terms only) Acong to deduct any mants to I if omit "+" " " and I if enclude X3, etc."
	5	+ if enclude x3, etc.
2. Let u=x-1		I - I for each wrong term
$\int (x+2)\sqrt{x-1} dx = \int (u+3)\sqrt{u} du$	IA	tall landes quen y as
$= \int (u^{\frac{3}{2}} + 3u^{\frac{1}{2}}) du$	IM	(For the question in
$= \frac{2}{5} u^{\frac{5}{2}} + 2 u^{\frac{3}{2}} + C$	1+1A	-1 if omit C.
$= \frac{2}{5} (x-1)^{\frac{5}{2}} + 2(x-1)^{\frac{3}{2}} + C$	1A 5	
3. Piff. w.r.t. x,	5	
$4xy + 2x^2y' + 2x + 2yy' = 0$	3A	-1 for each enrong ter
$y' = -\frac{2xy + x}{x^2 + y}$	14	
Putting $x=2$, $y=0$,	M-	Const. The second
Slope of tangent at $(2,0) = -\frac{1}{2}$	14	: : : - :
	6	
$\frac{dy}{dx} = -\sin(\sin x) \frac{d}{dx} \sin x$	> NAIM	optimate of the
$= - \left[\sin \left(\sin x \right) \right] \cos x$	1 A	
$\frac{d^2y}{dx^2} = -\cos x \frac{d}{dx} \left[\sin(\sin x) \right] - \left[\sin(\sin x) \right] \frac{d}{dx} \cos x$	x] A+11	y options. I for proc
$= -\left[\cos(\sin x)\right]\cos^2 x + \left[\sin(\pm i - x)\right]\sin x$	1+12	
		-
	1	}

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· · · · · · · · · · · · · · · · · · ·	Solution	24	harks	notes
5. (=) log x - log x		= 1 (2A)	for bens	Cand. not expected to
$\log_{4} x - \frac{\log_{4} x}{\log_{4} x}$	74 \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	1:3-1-12-1	ļ	cand. not expected to write log4 x + 0
1	1-0 7-2)=0 (100x=1	1-12 / 1-12 / 1-12 TO		0.602 ±1.306 log 4 ± 2 log 4 to 1 log 6
$log_{4}x = -1$		how with a	14	For any one correct
$\therefore \chi = \frac{1}{4} \text{or} $. 16		+ / A	· •
6. Egn. of AB	$y-2=\frac{2-\frac{1}{2}}{-4-2}$	(x+4)	IA .	•
	or $y = -\frac{1}{4}(x - \frac{1}{2})$	ł		
Grea require	$d = \int_{-4}^{2} \left[-\pm (\gamma - \mu) - \right]$	1	1.1/2/	A STATE OF THE STA
E TO CLAMA	$= \int_{-4}^{2} \left(-\frac{1}{8} \alpha^{2} - \frac{\gamma}{4} + \frac{\gamma}{4} \right)^{2}$ $= \int_{-4}^{2} \left(-\frac{\gamma}{8} \alpha^{2} - \frac{\gamma}{4} + \frac$	x		
	$= \left[-\frac{\chi}{2} - \frac{\chi}{8} + 2 \right]$ $= \left(-\frac{\$}{24} - \frac{5}{8} + 2 \right) - \frac{1}{8}$,		
* **	= 9		. <u>-</u> .,	a sur man
A. on under A	8	/_		· J
$= \left(\frac{1}{2} + 2\right)(2 - 2)$			2	
= 15 2 Area under Cl	irve	2 ~	•	
$= \int_{-\mu}^{2} ry dx$	$= \int_{-4}^{2} \frac{\chi^{2}}{3} = -\frac{1}{24} \chi^{2}$		المرا+ إمار ر	
i are reg	uned = $\frac{15}{2}$		IM	
	= ₹ RESTRICT	につの対	6	

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Solution	Marks	Notes
7. Let $P = (a, b)$, $M = (x, y)$.		
$\chi = \frac{a-1}{2}$	/A	
$y = \frac{b+2}{2}$	I A	
$\therefore a = 2x+1$	IM	
b = 2y-2 P lies on the circle		
$\Rightarrow (2\chi+1)^{2} + (2\chi-2)^{2} - 2(2\chi+1) - 4(2\chi-2) - 5 = 0$	IM+IA	Jan wrong a.b
$\frac{2x^{2}-2x^{2}-2x^{2}}{2x+2y^{2}-8y+3}=0$	14	for ex+ + uy = - 16y + 6= 0. Auc
8. (a) $\frac{dy}{dx} = \frac{2\pi}{y}$		
Putting $x=1$, $y=2$, $\frac{dy}{dx}=1$	IM+1A	
Eqn. of tangent is $y-2=x-1$	1A	optional
X-y+/==>	1 A 4	-1 if not implified
- Atternatively		
y, y = 2(x+x,)	IA	the end of the
2y = 2(x+1)	IM+	, e.
x - y + 1 = 0	#A	1
•		Company of the contract of
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Solution	Marks	uctes
8.(1) (i) Expanding C		
(2) $\chi^2 + y^2 - (2+k)\chi - (4-k)y + (5-k) = 0$	Q A	
$\left[X - (1 + \frac{1}{2})\right]^{2} + \left[Y - (2 - \frac{1}{2})\right]^{2} = \frac{1}{2} \left(\frac{2 + \frac{1}{2}}{2}\right)^{2} + \left[\frac{4 + \frac{1}{2}}{2}\right]^{2} + \left[\frac{4 + \frac{1}{2}}{2}\right$	M+1A (R.S) M+1A	If γ^2 given $\frac{1}{2}$, is amounted for checking γ :
(1,2) satisfies C	1M	Alt. solu. for (b) (i)
C represents a circle passing thro' (1,2)	-	Expanding (optional)
(ii) Centre of $C = (1 + \frac{k}{2}, 2 - \frac{k}{2})$	l+1A	creft x2= coeff y2)
$(ii) \atop (x+y) = (x-y) + 2(y-2) \frac{dy}{dx} + k(\frac{dy}{dx}-1) = 0$ $(x+y) = (x+y) + (x+y)$	1M George	$coeff. \times y = 0$ $g^{2}+f^{2}C = \frac{k^{2}}{2}IM \frac{y}{2}$
$\frac{-kx + ky - (-o) \cdot (iA)}{k(y - x - y)} \frac{dy}{dx} = \frac{k + 2 - 2x}{k - 4 + 2y}$	/ A	(1,2) satisfies C
$At (1,2), \frac{dy}{dx} = 1$	/A	
Equ. required is $y-x-1=0$	14	
(I) By (a) and (b), C represents a variable		
circle which shares a common tangent with the parabola y=4x at (1,2)	i M	3p - mid
If it's centre lies on x-y=3, from (bXii))	
$(1+\frac{1}{2})-(2-\frac{1}{2})=3$, M	(E) for sub. into X-4=
£ = 4	1 '	tor sub. into x-4=
: the required equ. is (x-1)+(2-2)+4(4-x-1)	=0 114	Hours for the form
$x^{2}+y^{2}-6x+1=0$	1A 5	Lobarda Com
		7000 1000 1000

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Solution	Marks	Ustes
9. (a) Let $P = (x, y)$.		
Slope of $PA = \frac{2J-3}{X-5}$	1 A	
Slope of $PB = \frac{4+3}{x+5}$	IA.	
$\frac{y-3}{x-5} \times \frac{y+3}{x+5} = k$		
•	2 M	
Locus of P is $kx^2-y^2=25k-9$	I A	
	5	
(1) (i) (inde, k=-1,	1A	
(ii) Ellipse but not cincle, k<0, k = -1.	1+ 1A	
(ii) Ny kesbola $k > 0$, $k \neq \frac{q}{25}$.	1+1A	
If k=0, two parallel lines have - your	- IA	
If $k = \frac{9}{25}$, two intersecting lines	2.4	_
17 Maria	8	4 ↑
(c) When $k=1$, the locus is the hyperbola		0
$x^2 - y^2 = 16$	/ A	3 /
Vol. reg. = $\int_{-3}^{3} \pi x^2 dy$	d mirgs	
-3 0 7	+1440	4
$= \int_{-3}^{3} \pi (16 + y^{2}) dy$	- 1M (g	and)
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	-3
$= \left[\pi \left(16y + \frac{4^3}{3} \right) \right]_{-3}^{3}$	IA	1
$= 114\pi$	1 A	Foresteine
	7	Liabout F - give
1x + 1, + (x, 1, x, 1, x, 1)		ghter so and , - h = 7 -
		E diduct 3

MESTRICIED MAI	アバイ	
Solution	Markes	notes
10. $\chi^2 - 2x - 1 = 0$ $\chi = \frac{2 \pm \sqrt{8}}{2}$	/ A	
$\alpha = \frac{1 + \sqrt{2}}{2^{-1/2}}, \beta = \frac{1 - \sqrt{2}}{-c^{-1/2}}, \alpha = \frac{1}{2^{-1/2}}$ (a) $U_{n+2} = \frac{1}{2\sqrt{2}} \left(\alpha^{n+2} - \beta^{n+2} \right)$		6 marks for 1st
$= \frac{1}{2\sqrt{2}} \left[\alpha^{2} (3+2\sqrt{2}) - \beta^{2} (3-2\sqrt{2}) \right]$ $= \frac{1}{2\sqrt{2}} \left[3 (\alpha^{2} - \beta^{2}) + 2\sqrt{2} (\alpha^{2} + \beta^{2}) \right]$	1M+ <u>/A</u>	6 marks for 1st comes given part, 3 m. for 2nd part.
$\therefore 2 \mathcal{U}_{n+1} + \mathcal{U}_n = \frac{2}{2\sqrt{2}} \left(\alpha^{n+1} \beta^{n+1} \right) + \frac{1}{2\sqrt{2}} \left(\alpha^n \beta^n \right)$	IA	
$= \frac{1}{2\sqrt{2}} \left[2\alpha^{n}(1+\sqrt{2}) - 2\beta^{n}(1-\sqrt{2}) + \alpha^{n}\beta^{n} \right]$	/A	
$=\frac{1}{2\sqrt{2}}\left[3(\alpha^{n}-\beta^{n})+2\sqrt{2}(\alpha^{n}+\beta^{n})\right]$	1A	
$V_{n+2} = \frac{1}{2\sqrt{2}} \left(\alpha^{n+2} + \beta^{n+2} \right)$ $= \frac{1}{2\sqrt{2}} \left[\alpha^{n} (3+2\sqrt{2}) + \beta^{n} (3-2\sqrt{2}) \right]$		Tilain _ 3.
$= \frac{1}{2\sqrt{2}} \left[3 (\alpha'' + \beta'') + 2\sqrt{2} (\alpha'' - \beta'') \right]$ $\therefore 2 V_{n+1} + V_n = \frac{2}{2\sqrt{2}} \left[\alpha''(1+\sqrt{2}) + \beta''(1-\sqrt{2}) \right] + \frac{1}{2\sqrt{2}} (\alpha'' + \beta'')$	2 A	·
$= \frac{1}{2\sqrt{2}} \left(3 \left(\alpha^{7} + \beta^{7} \right) + 2\sqrt{2} \left(\alpha^{7} - \beta^{7} \right) \right)$ $= \mathcal{N}_{n+2}$		
- 'U ₄₊₂ .	10	

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Solution	Marks	Niotes
10. (b) (i) $U_1 = \frac{1}{2\sqrt{2}} (\alpha - \beta) = 1$	2 A	
$U_2 = \frac{1}{2\sqrt{2}} \left(\alpha^2 - \beta^2 \right)$		
$= \frac{1}{2\sqrt{2}} \left[(3 + 2\sqrt{2}) - (3 - 2\sqrt{2}) \right] = 2$	2 A	
(ii) If Un, Un, one integers,	7 Gan	execute ~ (3)
UN+2 = 2 Uhnt Un most also be an integer.	1+1M	s for utigers.
(iii) Since U, U2 are integers and from		
(b) (ii), if Uk, Uk, one integers, Ukra is also an integer, by induction,		
Un is an integer for all n.	1+1	I for answer I for seasons.
(c) Un is not an integer for some n	8	I for answer
$e \cdot g$. $V_i = \frac{1}{\sqrt{2}}$	1+1	I for reasons.
$V_1 = \frac{1}{25}, (1+5) = 4 (1-15)$		
- 45.		
•		
•		
		3

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Solution	Markes	Notes
11. $\omega^{3}-1=(\omega-1)(\omega^{2}+\omega+1)=0$	14	
$\omega + 1 \Rightarrow \omega = \frac{-1 \pm \sqrt{3}i}{2}$	/A	Accept -1+82
= cis $\frac{2\pi}{3}$ (: o < amp(w)< π)	IA	
Let Z,=3 cis 0,		
then $= 2 = \omega = 3 \text{ cis} (0 + \frac{3}{3}\pi)^{2} \exp(-i\omega t)$	/A	
$Z_3 = \omega Z_2 = 3 \operatorname{cis}(\theta + \frac{4}{3}\pi)$	IA	
(a) A (Z ₁)		
B(Z2) Show < AOB = LBOC		
$\begin{array}{c} \downarrow \\ \downarrow $	op equal	(SW)
	2 M	of from
* C \(\frac{1}{2}\rightarrow\)		1300
(b) $ Z_2 = Z_3 = 3$	/ A	
	8	
(c) Since (2,1 = 221 = 231,		
A, B, C lie un a circle centred o	2	4 marks for and
n, v, c cir va a corac (earling o	2M	Correct method
LAOB=LAOC=LBOC= == == == ==========================		
Ds AOB, LOC, BOC are congruent	2M	
AABC is equilations.	4_	
•		

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$= \frac{2}{2} \frac{1}{1 + \omega^{2} + \omega^{4} + \omega + \omega^{3} + \omega^{2}}{1 + \omega^{2} + \omega^{2}}$ $= \frac{2}{2} \frac{1}{1 + \omega^{2} + \omega^{4} + \omega^{2} + \omega^{2}}{1 + \omega^{2} + \omega^{2}}$ $= 0, (\text{Since } 1 + \omega + \omega^{2} = 0)$ $= 0, (\text{Since } 1 + \omega + \omega + \omega^{2} = 0)$ $= 0, (\text{Since } 1 + \omega + \omega + \omega^{2} = 0)$ $= 0, (\text{Since } 1 + \omega + \omega + \omega + \omega^{2} = 0)$ $= 0, (\text{Since } 1 + \omega + \omega + \omega + \omega^{2} = 0)$ $= 0, (\text{Since } 1 + \omega +$	RESIRICIED 内部	义杆	•
$= Z_{1}^{2} + (\omega z_{1})^{2} + (\omega z_{1})^{2} + Z_{1}(\omega z_{1}) + (\omega z_{1})(\omega z_{2}) + (\omega z_{2})z_{1}$ $= Z_{1}^{2} (1 + \omega^{2} + \omega^{4} + \omega + \omega^{3} + \omega^{2})$ $= 2Z_{1}^{2} (1 + \omega + \omega^{2})$ $= 0, (Since 1+\omega + \omega^{2} = 0)$ $(2). Amb \frac{Z_{3}-Z_{1}}{Z_{2}-Z_{1}} = amb (Z_{3}-Z_{1}) - amb (Z_{2}-Z_{1})$ $= 2A$ $= Co^{\circ}$ $= 2A$ $= Co^{\circ}$ $= 2A$ $= Co^{\circ}$ $= 2A$ $= Co^{\circ}$ $= 2A$ $= 2$	Solution	Markes	nutes
$= 2\frac{3}{2}i(1+\omega+\omega^{2})$ $= 0, (since 1+\omega+\omega^{2}=0)$ $= 0, (since 1+\omega+\omega^{2}=0)$ $= 2\frac{3}{2}i^{2} = aub(z_{3}-z_{1}) - aub(z_{2}-z_{1})$ $= 2aub(z_{3}-z_{1}) - aub(z_{2}-z_{1})$ $= 2aub(z_{3}-z_{1})$ $= aub(\omega+1) (:\omega\pm1) 1A$ $= aub(\omega+1) (:\omega\pm1) 1A$ $= aub(z_{3}-z_{1}) = aub(z_{3}-z_{1}) = aub(z_{3}-z_{1})$ $= aub(\omega+1) (:\omega\pm1) 1A$ $= aub(z_{3}-z_{1}) = aub(z_{3}-z_{1}) = aub(z_{3}-z_{1})$ $= aub(z_{3}-z_{1}) = aub(z_{3}-z_{1}) = aub(z_{3}-z_{1}) = aub(z_{3}-z_{1})$	$= Z_1^2 + (\omega z_1)^2 + (\omega^2 z_1)^2 + Z_1(\omega z_1) + (\omega z_1)(\omega^2 z_1) + (\omega^2 z_1) z_1$	24	wite in polar form Er
(2) Amb $\frac{z_3-z_1}{z_2-z_1} = amb (z_3-z_1) - amb (z_2-z_1)$ = $2ab + 1$ = $2ab + 1$ = $2ab + 1$ Alternatively. Amb $\frac{z_3-z_1}{z_2-z_1} = amb \frac{(\omega^2-1)z_1}{(\omega-1)z_1}$ = $amb (\omega+1) (:\omega+1)$ = $amb (\frac{1}{2}+\frac{\sqrt{3}}{2}i)$ $1A$ = $amb (\frac{1}{2}+\frac{\sqrt{3}}{2}i)$ $1A$	$= 2\frac{3^{1}}{2}(1+\omega+\omega^{2})$		-1 if omit = 0"
$\frac{2\pi}{2} \frac{\delta(z)}{2} = \frac{2\pi}{2} \frac{1}{2} \frac{1}{$	(2). Amp $\frac{Z_3-Z_1}{Z_2-Z_1} = amp(Z_3-Z_1) - amp(Z_2-Z_1)$	/A	
$ \frac{\partial mp}{\partial z_{2}-\partial z_{1}} = \alpha mp \frac{(\omega^{2}-1) \partial z_{1}}{(\omega-1) \partial z_{1}} \qquad IA $ $ = \alpha mp (\omega+1) (:\omega \neq i) IA $ $ = \alpha mp \left(\frac{1}{2} + \sqrt{3} i\right) \qquad IA $ $ = (a^{0}) $	$= 60^{\circ} \qquad \qquad \omega + 1 \left(\begin{array}{c} 1 \\ 1 \end{array} \right)$ $= \frac{1}{2} \sqrt{\frac{35}{2}} \sqrt{1}$ $= \frac{1}{2} \sqrt{\frac{35}{2}} \sqrt{1}$	/A	<i>B(₹1) ₹</i> ;-
$= amp\left(\frac{1}{2} + \frac{\sqrt{3}}{2}i\right)$ $= (2)$	_	l A	C(2 3)
- 60°	$= amp\left(\frac{1}{2} + \sqrt{3}i\right)$		
	— 60°	IA	
) 1	• •		

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Solution	Marks	notes		
12.(a) Let $u = a - x$, we are distributed for $\int_{0}^{a} x f(x) dx = -\int_{a}^{0} (a - u) f(a - u) du$ must be written out	[A+ /A	for limits		
= 50(a-m)f(a-m)du = 3ive >M	I A	for So		
$= \int_0^a (a - u) f(u) du$	1,44	Using f(x) = f(a-x)		
$= \alpha \int_0^a f(u) du - \int_0^a u f(u) du$	IM.			
$= a \int_0^a f \otimes dx - \int_0^a x f \otimes dx.$	14			
$\int_0^a x f x dx = \frac{a}{2} \int_0^a f x dx$	1:Á			
(b) Putting $u = x - \frac{\pi}{2}$, by (a),				
$\int_{\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\sin^4 x}{\sin^4 x + \cos^4 x} dx = \int_{0}^{\frac{\pi}{2}} \frac{\sin^4 \left(u + \frac{\pi}{2}\right)}{\sin^4 \left(u + \frac{\pi}{2}\right) + \cos^4 \left(u + \frac{\pi}{2}\right)} du$	IM+IA	limits		
$= \int_0^{\frac{\pi}{2}} \frac{\cos^4 x}{\cos^4 x + \sin^4 x} dx$	/ <i>A</i>			
$\int_{0}^{\frac{\pi}{3}} \frac{\sin^{4}x}{\sin^{4}x + \cos^{4}x} dx = \int_{0}^{\frac{\pi}{2}} \frac{\sin^{4}x}{\sin^{4}x + \cos^{4}x} dx + \int_{\frac{\pi}{2}}^{\frac{\pi}{3}} \frac{\sin^{4}x}{\sin^{4}x + \cos^{4}x} dx$	24	The second second		
$= \int_{0}^{\frac{\pi}{2}} \frac{\sin^{4}x}{\sin^{4}x + \cos^{4}x} + \int_{0}^{\frac{\pi}{2}} \frac{\cos^{4}x}{\sin^{4}x + \cos^{4}x} dx$	14			
$= \int_0^{\frac{\pi}{2}} \frac{3in^4x + cos^4x}{5in^4x + cos^4x} dx$	2A			
$= \int_0^{\frac{\pi}{2}} dx = \frac{\pi}{2}$	14			
	9			
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a	Solution	Markes	no				
	12. (c) Let $f(x) = \frac{\sin^4 x}{\sin^4 x + \cos^4 x}$, then $f(x) = f(\pi - x) \forall x$.	mente 2M	24				
	$\int_0^{\frac{\pi}{3}} \frac{x \sin^4 x}{\sin^4 x + \cos^4 x} dx = \frac{\pi}{2} \int_0^{\frac{\pi}{3}} \frac{\sin^4 x}{\sin^4 x + \cos^4 x} dx, by(a)$	24					
A Commence of the Commence of	$= \frac{\widetilde{II}}{2} \cdot \frac{\widetilde{\eta}}{2} , \text{by (b)}$	14					
	$= \frac{\pi}{4} (= 2.467)$						
		5	-				
**************************************			-				