Question	Answer	Marks	Guidance
1	$\pm\frac{1}{3}(x+2)(2x+1)(x-3)$ isw	**3**	**B1** for $\pm$ with 3 factors or expanded out cubic **B1** for $\frac{1}{3}$ in a product with 3 factors **B1** for $(x+2)(2x+1)(x-3)$ and no extra terms or $2(x+2)(x+0.5)(x-3)$ and no extra terms
2	$x^{\frac{2}{3}}+x^{\frac{1}{3}}-6\ (=0)$ oe soi	**B1**	For multiplying through by $x^{\frac{1}{3}}$ Allow if substitution is used
	$\left(x^{\frac{1}{3}}+3\right)\left(x^{\frac{1}{3}}-2\right)\ (=0)$ oe	**M1**	Allow if substitution is used
	$x=-27$	**A1**	**A0** if rejects $x=-27$
	$x=8$	**A1**	
3(a)	$5x^2-30x+45\ (=0)$ or equivalent 3 term quadratic	**2**	**M1** for attempt to eliminate one variable
	Use of discriminant or solution to show one repeated root or a single solution	**A1**	Must have conclusion e.g. Discriminant = 0 (so tangent) oe One solution only (so tangent)
	Alternative 1		
	Centre of the circle (5, 2) Equation of radius perpendicular to given line $y-2=-\frac{1}{2}(x-5)$ Intersection at $(3,3)$	**(2)**	**M1** for a complete method to obtain the point of intersection
	Show that P lies on the circle or that $CP=\sqrt{5}$	**(A1)**	
	Alternative 2		
	The line $y=kx+n$ touches the circle $(x-p)^2+(y-q)^2=r^2$ if $(-kp+q-n)^2=r^2(1+k^2)$ so $(-(2\times5)+2-3)^2=5(1+2^2)$	**(2)**	**M1** for a complete method showing substitution, allow one slip
	25 = 25, so a tangent	**(A1)**	

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Question	Answer	Marks	Guidance
3(b)	(3, 3)	**2**	**B1** for each
3(c)	Radius = $3\sqrt{2}$ oe soi	**B1**	
	$(x-3)^2+(y-3)^2$ soi	**B1**	**FT** on *their* answer to **(b)** only
	$(x-3)^2+(y-3)^2=18$ oe	**B1**	ISW any expansion
4(a)	$[-\cos\theta]_0^{\pi}$	**B1**	May be implied by $(-\cos\pi)-(-\cos 0)$
	2	**B1**	
4(b)	$\dfrac{\frac{1}{\cos\alpha}}{\frac{\cos\alpha}{\sin\alpha}+\frac{\sin\alpha}{\cos\alpha}}$	**B1**	For ratios in terms of sine and cosine
	$\dfrac{\frac{1}{\cos\alpha}}{\frac{\cos^2\alpha+\sin^2\alpha}{\sin\alpha\cos\alpha}}$	**B1**	For simplifying the denominator to one term
	$\dfrac{\frac{1}{\cos\alpha}}{\frac{1}{\cos\alpha\sin\alpha}}$ $=\sin\alpha$	**B1**	Must show sufficient correct detail
	Alternative		
	$\dfrac{\frac{1}{\cos\alpha}}{\frac{1}{\tan\alpha}+\tan\alpha}$ or $\dfrac{\sec\alpha}{\frac{1}{\tan\alpha}+\tan\alpha}$	**(B1)**	For ratios in terms of tangent and cosine or secant and tangent
	$\dfrac{\frac{1}{\cos\alpha}}{\frac{\sec^2\alpha}{\tan\alpha}}$ or $\dfrac{\sec\alpha}{\frac{\sec^2\alpha}{\tan\alpha}}$ oe	**(B1)**	For dealing with the denominator
	$\dfrac{\tan\alpha}{\sec\alpha}=\dfrac{\sin\alpha}{\cos\alpha}\times\cos\alpha$ oe $=\sin\alpha$	**(B1)**	Must show correct sufficient detail

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