Question	Answer	Marks	Guidance
1	$(4k)^2 - 4k(3k+1)$	**M1**	For use of the discriminant to obtain a two term quadratic expression.
	$4k^2 - 4k = 0$	**M1**	Dep to find critical values, allow if only one is found
	$k = 0,\ k = 1$	**A1**	For both critical values
	$k < 0 \quad k > 1$	**A1**	
2(a)	$x^2\left(3e^{3x}\right) + 2xe^{3x}$	**3**	**M1** for differentiation of a product **A1** for $x^2\left(3e^{3x}\right)$ **A1** for $+2xe^{3x}$
2(b)(i)	$2x\left(3x^2+4\right)^{-\frac{2}{3}}$	**2**	**M1** for $kx\left(3x^2+4\right)^{-\frac{2}{3}}$
2(b)(ii)	$\left[\frac{1}{2}\left(3x^2+4\right)^{\frac{1}{3}}\right]_0^2$	**M1**	For $k\left(3x^2+4\right)^{\frac{1}{3}}$
	$\left[\frac{1}{2}\left(16^{\frac{1}{3}}\right) - \frac{1}{2}\left(4^{\frac{1}{3}}\right)\right]$	**M1**	**Dep** for correct substitution of limits into *their* integral
	0.466	**A1**	
3	$\left(\cot^2\theta + 1\right) + 2\cot^2\theta = 2\cot\theta + 9$	**B1**	For use of correct identity
	$(3\cot\theta + 4)(\cot\theta - 2) = 0$ $\cot\theta = -\frac{4}{3},\ \ \cot\theta = 2$	**M1**	For attempt to solve *their* quadratic in $\cot\theta$ to obtain $\cot\theta = k$
	$\tan\theta = -\frac{3}{4},\quad \tan\theta = \frac{1}{2}$	**M1**	For dealing with $\cot\theta = k$ correctly to get $\tan\theta = \frac{1}{k}$
	$\theta = -0.644$	**A1**	
	$\theta = 0.464$	**A1**	
4(a)	$64 - 48x^2 + 15x^4$	**3**	**B1** for 64 **B1** for $-48x^2$ **B1** for $15x^4$

Question	Answer	Marks	Guidance
4(b)	$9-\frac{6}{x^2}+\frac{1}{x^4}$	**B1**	
	$(their 64\times 9)+(their -48\times -6)+(their 15)$	**M1**	For considering terms independent of x, must have 3 terms
	879	**A1**	
5	$e^y = mx^2 + c$	**B1**	May be implied by later work
	$10 = 4.74m + c$ $5 = 2.24m + c$	**M1**	For at least one correct equation
	$5 = 2.5m$	**M1**	Dep for attempt to solve for m
	$m = 2,\ \ c = 0.52$	**A1**	For both
	$y = \ln\left(2x^2 + 0.52\right)$	**A1**	
	Alternative $e^y = mx^2 + c$	**(B1)**	May be implied by later work
	Gradient = $m = \frac{10-5}{4.74-2.24}$	**(M1)**	
	$10 = 4.74(their\ m) + c$ or $5 = 2.24(their\ m) + c$	**(M1)**	
	$m = 2,\ \ c = 0.52$	**(A1)**	For both
	$y = \ln\left(2x^2 + 0.52\right)$	**(A1)**	
6(a)	$\frac{\pi}{3}$	**B1**	
6(b)	$\frac{\pi a}{3}+4a$	**2**	**B2 FT** for $\left(their\frac{\pi}{3}\times a\right)+4a$ or **B1 FT** for $their\frac{\pi}{3}\times a$