Question	Answer	Marks	Guidance
1(a)	$243x^{10} - 45x^7 + \frac{10}{3}x^4$	**3**	**B1** for $243x^{10}$ **B1** for $-45x^7$ **B1** for $\frac{10}{3}x^4$
1(b)	$\left(1+\frac{1}{x^3}\right)^2 = 1+\frac{2}{x^3}+\frac{1}{x^6}$ oe	**B1**	
	Coefficient of term in x^4 $= 243-(2\times 45)+\frac{10}{3}$	**M1**	For *their* $243 + 2\times$ *their* $(-45) +$ *their* $\frac{10}{3}$ Must have 3 terms
	$\frac{469}{3}$ oe	**A1**	
2(a)	$\cos BOA = \frac{7}{32}$ or $\sin\frac{BOA}{2} = \frac{5}{8}$	**M1**	
	$BOA = 1.350(263...)$ $BOA = 1.35$ (correct to 2 dp)	**A1**	Must see detail of extra decimal places to justify 2 dp answer
2(b)	$8\theta = 18$	**M1**	
	$\theta = 2.25$	**A1**	
2(c)	$\angle AOC = 2\pi - 2.25 - 1.35...$ (2.683)	**M1**	For use of $2\pi -$ *their*$(b) - 1.35...$
	Area = $\frac{1}{2}64($*their* $2.683..)$	**M1**	For use of sector area formula
	85.9 or 85.8	**A1**	Allow awrt 85.9
	Alternative Area = $64\pi - \left(\frac{1}{2}\times 64\times 1.35...\right) - \left(\frac{1}{2}\times 64\times 2.683\right)$	**(2)**	**M1** for a correct plan **M1** for one correct use of sector area formula
	85.9 or 85.8	**(A1)**	Allow awrt 85.9 or 85.8

Question	Answer	Marks	Guidance
3(a)	$\left(2e^{3x}-5\right)\left(e^{3x}+1\right)=0$	**M1**	For attempt to solve a 3-term quadratic equation in e^{3x}, or using an appropriate substitution. May also be implied by correct use of quadratic formula
	$x=\frac{1}{3}\ln\frac{5}{2}$	**2**	**Dep M1** for a correct attempt to obtain x = … **A1** cao with negative root discounted.
3(b)	$e^{-x-7-7y}=e^{-2}$	**M1**	For correct attempt to deal with powers of e
	$x+7y=-5$	**A1**	
	$x^2+5x-126=0$ or $7y^2+5y-18=0$	**M1**	**Dep** for attempt to obtain a 3-term quadratic equation equated to zero in either x or y
	$x=-14,\ \ x=9$	**A1**	For both
	$y=\frac{9}{7},\ \ y=-2$	**A1**	For both
4(a)	Intercept = –2 soi	**B1**	
	$e^{4y}=\frac{2}{5}x-2$	**M1**	For attempt at straight line equation with *their* intercept
	$y=\frac{1}{4}\ln\left(\frac{2}{5}x-2\right)$ oe	**A1**	
4(b)	$y=\frac{1}{4}\ln 16$	**M1**	**Dep** on **M1** in part (a)
	$y=\ln 2$	**A1**	
4(c)	$x>5$	**1**	
5(a)	Acceleration $=18\cos 3t$	**2**	**B1** for $k\cos 3t$, $k\neq 2,\ k>0$
	$\cos 3t=-\frac{1}{2}$ oe	**M1**	For attempt to solve *their* $\cos 3t=-\frac{1}{2}$ to obtain a value for t
	$t=\frac{2\pi}{9}$ or 0.698	**A1**	