Question	Answer	Marks	Guidance
10(c)	Distance travelled = $2\times\left[\frac{3}{2}-\frac{3}{2}\cos 2t\right]_0^{\frac{\pi}{2}}$ using symmetry or $2\times\left(\frac{3}{2}-\frac{3}{2}\cos\left(2\frac{\pi}{2}\right)\right)$ using symmetry $\left[\frac{3}{2}-\frac{3}{2}\cos 2t\right]_0^{\frac{\pi}{2}}+\left\lvert\left[\frac{3}{2}-\frac{3}{2}\cos 2t\right]_{\frac{\pi}{2}}^{\pi}\right\rvert$ oe	**2**	**M1 dep** on *their s* from (b) unless restarted. Must be in the form of $k\cos 2t$ (+c) Condone the use of 0 to π as limits. Limits must be the correct way round and subtracted. **M1dep** for correct substitution of limits at least once **and** correct use of symmetry
	6	**A1**	
11	When $x=3,\ y=2$	**B1**	
	$\frac{\mathrm{d}y}{\mathrm{d}x}=(3x-1)^{-\frac{2}{3}}$	**M1**	Allow for $k(3x-1)^{-\frac{2}{3}}$
	When $x=3,\ \frac{\mathrm{d}y}{\mathrm{d}x}=\frac{1}{4}$	**A1**	
	Tangent equation: $y-2=\frac{1}{4}(x-3)$	**M1**	Allow using *their y* and *their* $\frac{\mathrm{d}y}{\mathrm{d}x}$
	Intercepts on the axes: $x=-5,\ y=\frac{5}{4}$	**A1**	For both
	Midpoint of AB: $\left(-\frac{5}{2},\frac{5}{8}\right)$	**M1**	**Dep** on **M** mark for equation of tangent **FT** on *their* intercepts
	Grad of perp bisector = –4	**M1**	**FT** on *their* $\frac{\mathrm{d}y}{\mathrm{d}x}$ or from their x and y intercept
	Perp bisector equation: $y-\frac{5}{8}=-4\left(x+\frac{5}{2}\right)$	**M1**	Allow using *their* – 4 and *their* midpoint
	$a-\frac{5}{8}=-4\left(a+\frac{5}{2}\right)$	**M1**	**Dep** on previous **M** mark for use of $(a,\ a)$ in *their* perp bisector equation
	$a=-\frac{15}{8},\ -1.875$	**A1**	

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Question	Answer	Marks	Guidance
12(a)	$\frac{dy}{dx} = \frac{x^2\left(\frac{1}{x}\right) - 2x\ln 3x}{x^4}$ oe $\frac{dy}{dx} = x^{-2} \times \frac{3}{3x} + \frac{-2}{x^3} \times \ln 3x$	**3**	**B1** for $\frac{1}{x}$ or $\frac{3}{3x}$ **M1** for a correct attempt at a quotient or a product **A1** for all terms apart from log derivative correct.
	$\frac{1-2\ln 3x}{x^3}$	**A1**	
12(b)	$\frac{\ln 3x}{x^2} = \int \frac{1-2\ln 3x}{x^3}\,dx$ $2\int \frac{\ln 3x}{x^3}\,dx = \int \frac{1}{x^3}\,dx - \frac{\ln 3x}{x^2}$ oe	**M1**	For using integration as a reverse of differentiation (reverse of part **(a)**) Allow using *their A* and *B* but do not allow any extra terms added or subtracted from *their* part **(a)**
	$\left(\int \frac{1}{x^3}\,dx = \right) -\frac{1}{2x^2}$ oe nfww	**B1**	**FT** on their *A*
	$-\frac{1}{4x^2} - \frac{\ln 3x}{2x^2} + c$ oe	**2**	**M1** dep for rearranging simplification **and** an attempt to integrate ax^{-3}. Allow if $+c$ is missing **A1** must include +c

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