Question	Answer	Marks	Guidance
9(b)	$e^{1-2x} = \frac{1}{e^{2x-1}}$	**B1**	Correct use of the reciprocal
	$10\left(e^{2x-1}\right)^2 - 11e^{2x-1} - 6 = 0$ or $6\left(e^{1-2x}\right)^2 + 11e^{1-2x} - 10 = 0$	**M1**	For a correct attempt to form a quadratic equation in e^{2x-1} or in e^{1-2x}
	$e^{2x-1} = \frac{3}{2}$ $\left(e^{2x-1} = -\frac{2}{5}\right)$ or $e^{1-2x} = \frac{2}{3}$ $\left(e^{1-2x} = -\frac{5}{2}\right)$	**M1**	**Dep** on attempt to solve *their* quadratic equation
	$x = \frac{1}{2} + \frac{1}{2}\ln\frac{3}{2}$ or exact equivalent only	**A1**	Allow $x = \frac{1+\ln\frac{3}{2}}{2}$ and $x = \frac{1}{2}\ln(\frac{3}{2}e)$ for **A1** **A0** if negative root not discounted
	Alternative Method: $\frac{10e^{2x}}{e} - 11 = \frac{6e}{e^{2x}}$	**B1**	Correct use of the reciprocal
	$10(e^{2x})^2 - 11e(e^{2x}) - 6e^2 = 0$	**M1**	For correct attempt to form a quadratic equation
	$e^{2x} = \frac{11e \pm 19e}{20}$	**M1**	**Dep** on attempt to solve *their* quadratic equation
	$x = \frac{1}{2}\ln(\frac{3}{2}e)\left[= \frac{1}{2}\ln\frac{3}{2} + \frac{1}{2}\right]$	**A1**	Allow $x = \frac{1+\ln\frac{3}{2}}{2}$ and $x = \frac{1}{2}\ln(\frac{3}{2}e)$ for **A1** **A0** if negative root not discounted
10(a)	$t = \frac{\pi}{2}$	**2**	**M1** for attempt at solution of $3\sin 2t = 0$ implied by 90 or $\frac{\pi}{2}$ **A0** for $t = 90$
10(b)	$-\frac{3}{2}\cos 2t$	**2**	**M1** for $k\cos 2t,\ k \neq 6$
	When $t = 0$, $s = 0$ so $c = \frac{3}{2}$	**M1**	**Dep** on attempt to find c using *their* s
	$s = \frac{3}{2} - \frac{3}{2}\cos 2t$	**A1**	Must be an expression for s

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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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