Question	Answer	Marks	Partial Marks
9(b)	$v = 0 \rightarrow e^{2t} - 5e^{t} - 6 = 0$ $\rightarrow \left(e^{t} + 1\right)\left(e^{t} - 6\right) = 0$	**M1**	Factorise quadratic Solve and discard $e^{t} = -1$
	$e^{t} = 6$	**A1**	
	$t = \ln 6 = 1.79$	**A1**	
9(c)	$t = \ln 6 \rightarrow a = 4 \times 36 - 10 \times 6 = 84$	**2**	**M1** for inserting *their* value of t into a
10(a)	$\frac{dy}{dx} = -\frac{(1+x)}{x} = -\left(\frac{1}{x} + 1\right)$	**2**	**M1** for using $m_1 \times m_2 = -1$
	$y = -\ln x - x + C$	**2**	**M1** for integrating $\frac{1}{x}$ **A1** for all correct including C
	$4 = -\ln 1 - 1 + C$ $C = 5 \rightarrow y = 5 - \ln x - x$	**A1**	Insert (1, 4) and arrive at correct answer. AG
10(b)	$x = 3 \rightarrow y = 2 - \ln 3$ and $\frac{dy}{dx} = -\frac{1}{3} - 1 = -\frac{4}{3}$	**B1**	
	$\frac{y - (2 - \ln 3)}{x - 3} = -\frac{4}{3}$	**M1**	
	$y = -\frac{4}{3}x + 6 - \ln 3$ or $y = -1.33x + 4.90$	**A1**	
11(a)	$\frac{dy}{dx} = x \times \frac{1}{2}\left(16 - x^2\right)^{-\frac{1}{2}} \times (-2x) + \left(16 - x^2\right)^{\frac{1}{2}}$	**3**	**B1** for $\frac{d}{dx}\left(16 - x^2\right)^{\frac{1}{2}}$ $= \frac{1}{2}\left(16 - x^2\right)^{-\frac{1}{2}} \times (-2x)$ **M1** for product rule **A1** for all correct
	$\frac{dy}{dx} = 0 \rightarrow \left(16 - x^2\right)^{\frac{1}{2}} = \frac{x^2}{\left(16 - x^2\right)^{\frac{1}{2}}}$ $x^2 = 8$ $\left(2\sqrt{2}, 8\right)$	**3**	**M1** for setting $\frac{dy}{dx} = 0$ and attempt to solve **M1** for obtaining $x^2 = k$ **A1**

Question	Answer	Marks	Partial Marks
11(b)	$\frac{3}{2}\left(16-x^2\right)^{\frac{1}{2}}\times(-2x)$	**2**	**M1** for attempt at chain rule **A1** for all correct unsimplified
	Area $=\int_1^3 x\left(16-x^2\right)^{\frac{1}{2}}\,\mathrm{d}x = \left[-\frac{1}{3}\left(16-x^2\right)^{\frac{3}{2}}\right]_1^3$ $=-\frac{1}{3}\left[7^{\frac{3}{2}}-15^{\frac{3}{2}}\right]=13.2$	**3**	**M1** for obtaining $k\left(16-x^2\right)^{\frac{3}{2}}$ **A1** for obtaining $k=-\frac{1}{3}$ **A1** for 13.2
12(a)	$\tan CAB=\frac{4}{3}$	**M1**	Correct use of tan oe
	$CAB=0.927$	**A1**	isw
12(b)	Angle $CBD=2\left(\frac{\pi}{2}-0.927\right)=1.287$	**B1**	
	Perimeter $=3(2\pi-2\times0.927)+4(2\pi-1.287)$ $=13.287+19.985$ $=33.3$	**3**	**M1** for correct plan of two arcs **A1** for either arc **A1**
12(c)	Area of two right-angled triangles $=\frac{1}{2}\times3\times4\times2=12$	**B1**	
	Area of Sectors $=\frac{3^2}{2}(2\pi-2\times0.927)+\frac{4^2}{2}(2\pi-1.287)$ $=19.93+39.97$ Total = 71.9	**3**	**M1** for correct plan of two sectors plus triangles **A1** for either sector **A1**

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