Question	Answer	Marks	Partial Marks
8(d)	Forms $\overrightarrow{AB}$ or $\overrightarrow{BA}$ when $t = 1$ e.g. $\overrightarrow{BA} = (32\mathbf{i} + (16 - 9\sqrt{3})\mathbf{j}) - (29\mathbf{i} + (16 - 12\sqrt{3})\mathbf{j})$ oe	**B1**	**FT** *their* (b) and (c) with $t = 1$
	$\sqrt{3^2 + (3\sqrt{3})^2}$	**M1**	**FT** *their* $\overrightarrow{AB}$ or $\overrightarrow{BA}$
	6 (km)	**A1**	cao
9(a)	$h = \sqrt{x^2 - \left(\frac{x}{2}\right)^2}$ oe or $\cos 30 = \frac{h}{x}$ oe or $\frac{1}{2}xh = \frac{1}{2}x^2 \sin 60$	**M1**	Correct expression connecting x and h
	$x = \frac{2h}{\sqrt{3}}$ oe	**A1**	Must be $x =$
	$V = \frac{1}{2} \times \left(their \frac{2h}{\sqrt{3}}\right)^2 \times \sin 60° \times 5$ or $\frac{1}{2} \times h \times their \frac{2h}{\sqrt{3}} \times 5$	**M1**	
	Correct completion to given answer $V = \frac{5\sqrt{3}h^2}{3}$	**A1**	
9(b)	Correct derivative of V e.g. $\frac{10\sqrt{3}}{3}h$	**B1**	
	$\frac{dh}{dt} = \frac{dV}{dt} \times \frac{dh}{dV}$ soi	**B1**	Not $\frac{\partial V}{\partial h}$
	$0.5 \div \left(\frac{10\sqrt{3}}{3} \times 0.1\right)$ oe	**M1**	
	0.866 (metres per minute) or 0.8660[25…] rot to 4 or more sf	**A1**	Allow $\frac{\sqrt{3}}{2}$ isw
10(a)	$\ln x - 1$	**B2**	**B1** for $[1\times]\ln x + x \times \frac{1}{x}[-2]$ oe

Question	Answer	Marks	Partial Marks
10(b)	$x+\frac{1}{x}+2$	**B1**	
	$\frac{\mathrm{d}y}{\mathrm{d}x}=\frac{x^2}{2}+\ln x+2x(+c)$	**M2**	**M1** for $\frac{\mathrm{d}y}{\mathrm{d}x}=...+\ln x+...$ or for $\frac{\mathrm{d}y}{\mathrm{d}x}=\frac{x^2}{2}+...+2x$
	Substitution to find c: $\frac{\mathrm{e}^2}{2}+2\mathrm{e}=\frac{\mathrm{e}^2}{2}+\ln\mathrm{e}+2\mathrm{e}+c$ $[c=-1]$	**M1**	**FT** *their* attempt to integrate dependent on at least **M1**
	$y=\int\left(\frac{x^2}{2}+2x+\ln x-1\right)\mathrm{d}x$	**A1**	
	Integrates and uses (a) $y=\frac{x^3}{6}+\frac{2x^2}{2}+x\ln x-2x+C$	**M1**	Dependent on **M2M1** **FT** error in c only
	$\frac{\mathrm{e}^3}{6}+\mathrm{e}^2=\frac{\mathrm{e}^3}{6}+\mathrm{e}^2+\mathrm{e}\ln\mathrm{e}-2\mathrm{e}+C$	**M1**	Substitution to find C Dependent on previous **M1**
	$y=\frac{x^3}{6}+x^2+x\ln x-2x+\mathrm{e}$	**A1**	
11	$B\left(\frac{\pi}{10},0\right)$ soi	**B1**	
	$\int_0^{\frac{\pi}{4}}\mathrm{e}^{\frac{x}{2}}\,\mathrm{d}x-\int_0^{\frac{\pi}{10}}\cos 5x\,\mathrm{d}x$	**M2**	**M1** Integrates $\mathrm{e}^{\frac{x}{2}}$ to $k\mathrm{e}^{\frac{x}{2}}$, $k\neq 0$ **M1** Integrates $\cos 5x$ to $k\sin 5x$, $k>0$ or $k=-\frac{1}{5}$
	$\left[2\mathrm{e}^{\frac{x}{2}}\right]_0^{\frac{\pi}{4}}-\left[\frac{\sin 5x}{5}\right]_0^{\frac{\pi}{10}}$	**A2**	**A1** for each part correct
	$\left[2\mathrm{e}^{\frac{\pi}{8}}-2\mathrm{e}^0\right]-\left[\frac{1}{5}\sin\frac{5\pi}{10}-\frac{1}{5}\sin 0\right]$	**M1**	**M1** for correct attempt at subtraction and for one correct use of limits dependent on at least **M1**for integration and **B1**
	$2\mathrm{e}^{\frac{\pi}{8}}-\frac{11}{5}$ isw	**A1**	

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