Question	Answer	Marks	Guidance
7(a)	$\frac{\sin^2 x+(1-\cos x)^2}{(1-\cos x)\sin x}$ or $\frac{\sin^2 x}{(1-\cos x)\sin x}+\frac{(1-\cos x)^2}{(1-\cos x)\sin x}$	**M1**	
	$\frac{\sin^2 x+1-2\cos x+\cos^2 x}{(1-\cos x)\sin x}$	**A1**	OR $\frac{1-\cos^2 x+(1-\cos x)^2}{(1-\cos x)\sin x}$
	$\frac{1+1-2\cos x}{(1-\cos x)\sin x}$ or $\frac{1-\cos^2 x+1-2\cos x+\cos^2 x}{(1-\cos x)\sin x}$	**A1**	OR $\frac{(1-\cos x)(1+\cos x)+(1-\cos x)^2}{(1-\cos x)\sin x}$
	Fully correct justification of given answer: $\frac{2(1-\cos x)}{(1-\cos x)\sin x}=2\operatorname{cosec} x$ or $\frac{2-2\cos x}{(1-\cos x)\sin x}=\frac{2}{\sin x}=2\operatorname{cosec} x$ or equivalent	**A1**	All steps correct and final step justified OR $\frac{1+\cos x+1-\cos x}{\sin x}=2\operatorname{cosec} x$
	Alternative		
	$\frac{\sin x(1+\cos x)}{(1-\cos x)(1+\cos x)}+\frac{(1-\cos x)\sin x}{\sin x\sin x}$ or $\frac{\sin x(1+\cos x)}{1-\cos^2 x}+\frac{(1-\cos x)\sin x}{\sin^2 x}$	**(M1)**	
	$\frac{\sin x+\sin x\cos x}{\sin^2 x}+\frac{\sin x-\cos x\sin x}{\sin^2 x}$	**(A1)**	
	$\frac{2\sin x}{\sin^2 x}$	**(A1)**	
	Fully correct justification of given answer: $\frac{2}{\sin x}=2\operatorname{cosec} x$	**(A1)**	All steps correct and final step justified

Question	Answer	Marks	Guidance
7(b)	$3\sin^2 x - \sin x - 2 \quad [=0]$ soi	**B1**	
	$(3\sin x + 2)(\sin x - 1)$ [= 0] oe	**M1**	
	$\sin x = -\frac{2}{3}$, $\sin x = 1$	**A1**	
	90 221.8 or 221.81[03…] rot to 2 or more dp 318.2 or 318.18[96…] rot to 2 or more dp	**A1**	and no extras in range If **B1 M1 A0 A0** allow **SC1** for 221.8 or 221.81[03…] rot to 2 or more dp **and** 318.2 or 318.18[96…] rot to 2 or more dp and no extras in range
8(a)	$2\pi rh + 2\pi r^2 + \pi r^2$ [= 300] oe	**M1**	
	$h = \frac{300 - 3\pi r^2}{2\pi r}$ oe, isw	**A1**	
8(b)	$V = \pi r^2\left(\textit{their}\ \frac{300 - 3\pi r^2}{2\pi r}\right) + \frac{2}{3}\pi r^3$ oe	**M2**	**FT** *their h* providing in terms of *r* and derived from a dimensionally correct equation in **(a)**; **M1** for $V = \pi r^2\left(\textit{their}\ \frac{300 - 3\pi r^2}{2\pi r}\right) + k\pi r^3$, $k \neq \frac{2}{3}$ oe
	Correct completion to given answer: $150r - \frac{5}{6}\pi r^3$ nfww	**A1**	
8(c)	Derivative of V: $150 - \frac{5}{2}\pi r^2$ oe, soi, isw	**B1**	
	$\textit{their}\left(150 - \frac{5}{2}\pi r^2\right) = 0$ and solves as far as r = …	**M1**	**FT** $\textit{their}\ \frac{\mathrm{d}V}{\mathrm{d}r}$ providing that at least one term is correct
	$r = \sqrt{\frac{300}{5\pi}}$ oe or 4.37 (cm)	**A1**	
	$150(\textit{their}\,4.37) - \frac{5}{6}\pi(\textit{their}\,4.37)^3$	**M1**	**FT** *their* 4.37
	437 or awrt 437 (cm^3) isw	**A1**	