

Q	Marking Instructions	AO	Marks	Typical Solution
17	Translates $f' \left(\frac{\pi}{6} \right)$ into $\lim_{h \rightarrow 0} \frac{\sin \left(\frac{\pi}{6} + h \right) - \sin \left(\frac{\pi}{6} \right)}{h}$	AO1.1a	M1	$f' \left(\frac{\pi}{6} \right) = \lim_{h \rightarrow 0} \left[\frac{\sin \left(\frac{\pi}{6} + h \right) - \sin \left(\frac{\pi}{6} \right)}{h} \right]$
	Uses $\sin(A+B)$ identity to replace $\sin \left(\frac{\pi}{6} + h \right)$, to commence argument (at least two lines of argument seen)	AO2.1	M1	$= \lim_{h \rightarrow 0} \left[\frac{\sin \frac{\pi}{6} \cos h + \cos \frac{\pi}{6} \sin h - \sin \left(\frac{\pi}{6} \right)}{h} \right]$
	Obtains correct two term expression involving $\cos h$ and $\sin h$	AO1.1b	A1	$= \lim_{h \rightarrow 0} \left[\frac{\frac{1}{2} \cos h + \frac{\sqrt{3}}{2} \sin h - \frac{1}{2}}{h} \right]$
	Deduce what happens as $h \rightarrow 0$, for one part of 'their' expression using the limit of $\frac{\sin h}{h}$ OR by using small angles approximations	AO2.2a	R1	$= \lim_{h \rightarrow 0} \left[\frac{1}{2} \left(\frac{\cos h - 1}{h} \right) + \frac{\sqrt{3}}{2} \frac{\sin h}{h} \right]$ $= \lim_{h \rightarrow 0} \left[\frac{1}{2} \left(\frac{-2\sin^2 \left(\frac{h}{2} \right)}{\frac{2h}{2}} \right) + \frac{\sqrt{3}}{2} \frac{\sin h}{h} \right]$ $= \left(\lim_{h \rightarrow 0} \frac{-\sin \left(\frac{h}{2} \right)}{2} \right) \left(\lim_{h \rightarrow 0} \frac{\sin \left(\frac{h}{2} \right)}{\left(\frac{h}{2} \right)} \right) + \frac{\sqrt{3}}{2} \lim_{h \rightarrow 0} \frac{\sin h}{h}$
	Deduce what happens as $h \rightarrow 0$, for the second part of 'their' expression using the limit of $(\cos h - 1)h$ OR by using small angle approximations	AO2.2a	R1	$= 0 \times 1 + \frac{\sqrt{3}}{2} \times 1$ $= \frac{\sqrt{3}}{2}$
Completes a rigorous argument leading to the correct exact value, with all the steps in the method clearly shown.	AO2.1	R1		
	Total		6	
	TOTAL		100	