

Q	Marking Instructions	AO	Marks	Typical Solution
8(a)	Compares with $R \cos(x \pm \alpha)$ or $R \sin(x \pm \alpha)$	AO3.1a	M1	$\sqrt{3} \sin x - 3 \cos x \equiv R \sin(x - \alpha)$ $\equiv R \sin x \cos \alpha - R \cos x \sin \alpha$
	Obtains two correct equations for R and α for example $R \cos \alpha = \sqrt{3}$ $R \sin \alpha = 3$ Must be explicitly seen	AO3.1a	M1	$R \cos \alpha = \sqrt{3}$ $R \sin \alpha = 3$ $R = \sqrt{12} = 2\sqrt{3}$ $\tan \alpha = \sqrt{3}$ $\alpha = \frac{\pi}{3}$ $y = 2\sqrt{3} \sin(x - \frac{\pi}{3}) + 4$
	Obtains correct R Condone AWRT 3.46 PI by description of stretch	AO1.1b	B1	
	Obtains correct α in radians or degrees PI by description of translation	AO1.1b	B1	
	Interprets their values of R and α to form an equation of the form $y = R \sin(x \pm \alpha) + 4$ or $y = R \cos(x \pm \alpha) + 4$	AO3.2a	B1F	Translation $\begin{pmatrix} \frac{\pi}{3} \\ 0 \end{pmatrix}$ Stretch in the y-direction scale factor $2\sqrt{3}$
	Interprets 'their' equation to identify a transformation	AO3.2a	E1F	
	Identifies all required transformations in a correct order CAO	AO3.2a	A1	Translation $\begin{pmatrix} 0 \\ 4 \end{pmatrix}$
(b)(i)	Deduces the least value occurs when their $\sin(x - \frac{\pi}{3}) = 1$ Using 'their' values of R and α PI by sight of $\frac{1}{2\sqrt{3} + 4}$	AO2.2a	M1	$\frac{1}{\sqrt{3} \sin x - 3 \cos x + 4} = \frac{1}{2\sqrt{3} \sin(x - \frac{\pi}{3}) + 4}$ Least value when $\sin(x - \frac{\pi}{3}) = 1$ \therefore least value is given by
	Completes rigorous argument to obtain $\frac{1}{2\sqrt{3} + 4}$ and then the given answer	AO2.1	R1	$\frac{1}{2\sqrt{3} + 4} = \frac{2 - \sqrt{3}}{2}$
(b)(ii)	Deduces the greatest value Using 'their' values of R and α ACF $\frac{1}{-2\sqrt{3} + 4} = \frac{2 + \sqrt{3}}{2}$	AO2.2a	B1F	Greatest value = $\frac{2 + \sqrt{3}}{2}$
	Total		10	