

Q	Marking Instructions	AO	Marks	Typical Solution
5(a)	Compares with $R \cos(\theta \pm \alpha)$ or $R \sin(\theta \pm \alpha)$	AO3.1a	M1	$R \cos(\theta - \alpha)$ $\equiv R \sin \alpha \cos \theta + R \sin \theta \sin \alpha$
	Identifies version which will allow them to solve the problem	AO3.1a	A1	$\therefore R \cos \alpha = 3$ and $R \sin \alpha = 3$
	Obtains correct $R$	AO1.1b	A1	$R = \sqrt{18}$
	Obtains correct $\alpha$	AO1.1b	A1	$\alpha = \frac{\pi}{4}$
	Interprets 'their' equation to identify first transformation	AO3.2a	E1	$\therefore 3 \cos \theta + 3 \sin \theta \equiv \sqrt{18} \cos \left( \theta - \frac{\pi}{4} \right)$
	Interprets 'their' equation to identify second transformation	AO3.2a	E1	Which is a stretch in the y-direction scale factor $\sqrt{18}$ and a translation $\begin{pmatrix} \frac{\pi}{4} \\ 0 \end{pmatrix}$
(b)	Constructs a rigorous mathematical argument, to find either the least or greatest value  Only award if they have a completely correct solution, which is clear, easy to follow and contains no slips (no FT for this mark)	AO2.1	R1	$4 + (3 \cos \theta + 3 \sin \theta)^2$ $4 + \left( \sqrt{18} \cos \left( \theta + \frac{\pi}{4} \right) \right)^2$
	Deduces the least value Using 'their' values of $R$ and $\alpha$	AO2.2a	A1F	Least value occurs when $\cos^2 \left( \theta + \frac{\pi}{4} \right) = 0$ $\therefore$ least value = 4
	Deduces the greatest value Using 'their' values of $R$ and $\alpha$	AO2.2a	A1F	Greatest value occurs when $\cos^2 \left( \theta + \frac{\pi}{4} \right) = 1$ greatest value = $4 + 18$ $= 22$
<b>Total</b>			<b>9</b>	