$$
\begin{aligned}
|\vec{a} - \vec{b}|^2 &= (a\cos\alpha - b\cos\beta)^2 - (a\sin\alpha - b\sin\beta)^2 \\
&= (a^2\cos^2\alpha - 2ab\cos\alpha\cos\beta + b^2\cos^2\beta) + (a^2\sin\alpha - 2ab\sin\alpha\sin\beta + b^2\sin^2\beta) \\
&= a^2 + b^2 - 2ab(\cos\alpha\cos\beta + \sin\alpha\sin\beta
\end{aligned}
$$