Precalculus
Proving Pythagorean identity with angle sum formulas

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Recall the angle sum formula $\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$.

Example

Show that the Pythagorean identity $\sin^2\theta + \cos^2\theta = 1$ follows from the angle difference formula.

$$
\begin{aligned}
1 &= \cos 0 \\
&= \cos(\theta - \theta) \\
&= \cos\theta\cos\theta + \sin\theta\sin\theta \\
&= \cos^2\theta + \sin^2\theta,
\end{aligned}
$$

as desired.