MATH 11022: Double Angle Identities

$$\begin{aligned}
\sin 2\theta &= 2\sin\theta\cos\theta \\
\cos 2\theta &= \cos^2\theta - \sin^2\theta \\
\cos 2\theta &= 1 - 2\sin^2\theta \\
\cos 2\theta &= 2\cos^2\theta - 1 \\
\tan 2\theta &= \frac{2\tan\theta}{1-\tan^2\theta}
\end{aligned}$$

Example 1: Find the value of $\sin 2\beta$, if $\sin\beta = -\dfrac{12}{13}$ and $\cos\beta < 0$.

Example 2: Verify each of the following identities.

(a) $\sin 2\alpha \cos 2\alpha = \sin 2\alpha - 4\sin^3 \alpha \cos \alpha$

(b) $\dfrac{1 + \cos 2x}{\sin 2x} = \cot x$