



Math for the people, by the people.

### proof of double angle identity

Canonical name	ProofOfDoubleAngleIdentity
Date of creation	2013-03-22 12:50:30
Last modified on	2013-03-22 12:50:30
Owner	drini (3)
Last modified by	drini (3)
Numerical id	4
Author	drini (3)
Entry type	Proof
Classification	msc 51-00

**Sine:**

$$\begin{aligned}\sin(2a) &= \sin(a + a) \\ &= \sin(a) \cos(a) + \cos(a) \sin(a) \\ &= 2 \sin(a) \cos(a).\end{aligned}$$

**Cosine:**

$$\begin{aligned}\cos(2a) &= \cos(a + a) \\ &= \cos(a) \cos(a) + \sin(a) \sin(a) \\ &= \cos^2(a) - \sin^2(a).\end{aligned}$$

By using the identity

$$\sin^2(a) + \cos^2(a) = 1$$

we can change the expression above into the alternate forms

$$\cos(2a) = 2 \cos^2(a) - 1 = 1 - 2 \sin^2(a).$$

**Tangent:**

$$\begin{aligned}\tan(2a) &= \tan(a + a) \\ &= \frac{\tan(a) + \tan(a)}{1 - \tan(a) \tan(a)} \\ &= \frac{2 \tan(a)}{1 - \tan^2(a)}.\end{aligned}$$