

Prove each identity.

$$1) \cos 2x + 2 \sin^2 x = 1$$

$$2) \frac{2}{1 + \cos 2x} = \sec^2 x$$

$$3) \frac{\sin 2x}{\cos 2x + \sin^2 x} = 2 \tan x$$

$$4) \frac{2 \sin x \cos x}{\cos^2 x - \sin^2 x} = \tan 2x$$

$$5) \cos^4 x - \sin^4 x = \cos 2x$$

$$6) 1 - (\sin x + \cos x)^2 = -\sin 2x$$

$$7) \frac{2(\tan x - \cot x)}{\tan^2 x - \cot^2 x} = \sin 2x$$

$$8) \frac{1}{1 - \tan x} - \frac{1}{1 + \tan x} = \tan 2x$$