



Unit 4 – Trigonometric Identities and Equations
Chapter 7.4 : Proving Trigonometric Identities

Need to Know

- The following trigonometric identities are important for you to remember:

**Identities Based
on Definitions**

Reciprocal Identities

$$\csc x = \frac{1}{\sin x}$$

$$\sec x = \frac{1}{\cos x}$$

$$\cot x = \frac{1}{\tan x}$$

**Identities Derived from
Relationships**

Quotient Identities

$$\tan x = \frac{\sin x}{\cos x}$$

$$\cot x = \frac{\cos x}{\sin x}$$

Pythagorean Identities

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

$$1 + \tan^2 x = \sec^2 x$$

$$1 + \cot^2 x = \csc^2 x$$

Double Angle Formulas

$$\sin 2x = 2 \sin x \cos x$$

$$\cos 2x = \cos^2 x - \sin^2 x$$

$$= 2 \cos^2 x - 1$$

$$= 1 - 2 \sin^2 x$$

$$\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$$

Addition and Subtraction Formulas

$$\sin (x + y) = \sin x \cos y + \cos x \sin y$$

$$\sin (x - y) = \sin x \cos y - \cos x \sin y$$

$$\cos (x + y) = \cos x \cos y - \sin x \sin y$$

$$\cos (x - y) = \cos x \cos y + \sin x \sin y$$

$$\tan (x + y) = \frac{\tan x + \tan y}{1 - \tan x \tan y}$$

$$\tan (x - y) = \frac{\tan x - \tan y}{1 + \tan x \tan y}$$

Example 1: Prove that $\frac{\cos (x-y)}{\cos (x+y)} = \frac{1+\tan x \tan y}{1-\tan x \tan y}$



Example 2: Prove $\sin^2 \theta + \cos^4 \theta = \cos^2 \theta + \sin^4 \theta$

Example 3: Prove $(\sin x + \cos x) \left(\frac{\tan^2 x + 1}{\tan x} \right) = \frac{1}{\cos x} + \frac{1}{\sin x}$