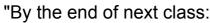
# 7.4 Proving Trigonometric Identities



I can prove any identity using previously established identities.

To disprove a claim, I understand that I only require a counterexample to it. I can apply what I have learned in unfamiliar settings."

## **Identities Based** on Definitions

### **Identities Derived from** Relationships

# Reciprocal Identities

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

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

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

#### Cofunction Identities

$$\sin\theta = \cos\left(\frac{\pi}{2} - \theta\right)$$

$$\tan\theta = \cot\left(\frac{\pi}{2} - \theta\right)$$

$$\cos \theta = \sin \left(\frac{\pi}{2} - \theta\right)$$

$$\tan \theta = \cot \left(\frac{\pi}{2} - \theta\right)$$

# 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

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

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

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

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

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

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

### Odd and Even Function Identities

$$\cos(-\theta) = \cos\theta$$

$$\sin(-\theta) = -\sin\theta$$

Ex. 1: Prove  $\frac{1}{1+\cos\theta} + \frac{1}{1-\cos\theta} = \frac{2}{\sin^2\theta}$ 

**Ex. 2:** Prove that  $\cos 2x = 2\cos x$  is not an identity.

Ex. 3: Use a compound angle identity to prove that

$$\sin\!\left(\frac{\pi}{2} - \theta\right) = \cos\theta$$

**Today's Work:**pp. 417-418 #1, 5ac, 8,9abc, 17 **Next class:** p. 418 #10abce, 11bdgjl

The textbook answer section for 7.4 is poorly written. For example, all identity proofs should always have a LS and RS chart; the answer section does not do this.