

## §8.4 Sum and Difference Formulas

**REMEMBER YOU KNOW ALGEBRA !**

### Sum or Difference of Two Angles Identities

$$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

$$\tan(\alpha + \beta) = \frac{\tan \alpha + \tan \beta}{1 - \tan \alpha \tan \beta}$$

$$\tan(\alpha - \beta) = \frac{\tan \alpha - \tan \beta}{1 + \tan \alpha \tan \beta}$$

### Cofunction Identities

$$\sin(90^\circ - \theta) = \cos \theta \quad \cos(90^\circ - \theta) = \sin \theta$$

$$\tan(90^\circ - \theta) = \cot \theta \quad \cot(90^\circ - \theta) = \tan \theta$$

$$\sec(90^\circ - \theta) = \csc \theta \quad \csc(90^\circ - \theta) = \sec \theta$$

Example 1 Find the exact value.  $\cos 75^\circ$

Example 2 Find the exact value.  $\cos \frac{\pi}{12}$

Example 3 Find the exact value.  
 $\sin 80^\circ \cos 20^\circ - \cos 80^\circ \sin 20^\circ$

Example 4 Prove a Cofunction  $\cos\left(\frac{\pi}{2} - x\right)$

Example 5 Simplify. (Identity)  
 $\tan(\theta + \pi)$

Example 6 Given  $\sin \alpha = \frac{4}{5}$ ,  
 $\alpha$  in quadrant II, and  
 $\sin \beta = \frac{-2\sqrt{5}}{5}$ , in quadrant  
III, find  $\cos(\alpha + \beta)$