

Section 6.1

Sum and Difference Formulas for Sine, Cosine and Tangent

$$\sin(A + B) = \sin A \cos B + \sin B \cos A$$

$$\sin(A - B) = \sin A \cos B - \sin B \cos A$$

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

These six formulas will be provided for you on the final exam. You do not need to memorize them.

You will need to know how to use them. The following examples will show the types of problems we can solve using these formulas.

Example 1: Simplify each:

a. $\cos(60^\circ - x)$

b. $\sin\left(x + \frac{\pi}{4}\right) - \sin\left(x - \frac{\pi}{4}\right)$

Example 2: Simplify each.

a. $\sin 45^\circ \cos 30^\circ - \sin 30^\circ \cos 45^\circ$

b. $\cos \frac{\pi}{7} \cos \frac{2\pi}{3} + \sin \frac{\pi}{7} \sin \frac{2\pi}{3}$

c. $\frac{\tan 83^\circ - \tan 16^\circ}{1 + \tan 83^\circ \tan 16^\circ}$

Example 3: Find the exact value of each:

a. $\sin 15^\circ$

b. $\cos\left(\frac{7\pi}{12}\right)$

Math 1330 Section 6.1

As in the previous problem, the point is to break up the given angle into a sum or difference of two familiar angles from the unit circle.

Note: $\frac{13\pi}{12} = \frac{\pi}{12} + \frac{12\pi}{12}$ will this work?

Note: $\frac{13\pi}{12} = \frac{2\pi}{12} + \frac{11\pi}{12}$ will this work?

Note: $\frac{13\pi}{12} = \frac{3\pi}{12} + \frac{10\pi}{12}$ will this work?

c. Given $\tan x = -2$, evaluate $\tan\left(x - \frac{3\pi}{4}\right)$

Example 4: Suppose that $\sin \alpha = \frac{3}{5}$ and $\cos \beta = \frac{5}{13}$ where $0 < \alpha < \beta < \frac{\pi}{2}$. Find each of these:

a. $\sin(\alpha + \beta)$

b. $\cos(\alpha - \beta)$

