Unit 7: Trig Identities, Inverses, and Equations (Trig Entree)

Important Identities

while all of them are in the data booklet you will need to memorize some of these!!

1. Pythagorean Identities

$$\cos^2 x + \sin^2 x = 1$$
$$1 + \tan^2 x = \sec^2 x$$
$$\cot^2 x + 1 = \csc^2 x$$

2. Even/Odd Identities

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

3. Complementary Angle Identities

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

4. Sum/Difference Identities

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

5. Double Angle Identities

$$\cos(2x) = \begin{cases} \cos^2 x - \sin^2 x \\ 2\cos^2 x - 1 \\ 1 - 2\sin^2 x \end{cases}$$

$$\sin(2x) = 2\sin x \cos x$$

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

Purpose of Trig Identities

1. finding values of trig functions not at multiples of $\frac{\pi}{6}$ or $\frac{\pi}{4}$

   Ex: $Sin\left(\frac{7\pi}{12}\right) = Sin\left(\frac{3\pi}{12} + \frac{4\pi}{12}\right) = Sin\left(\frac{\pi}{4} + \frac{\pi}{3}\right)$

2. rewrite expressions

   Ex: $Sin\left(\frac{\pi}{18}\right)Cos\left(\frac{\pi}{9}\right) + Cos\left(\frac{\pi}{18}\right)Sin\left(\frac{\pi}{9}\right) = Sin\left(\frac{\pi}{18} + \frac{\pi}{9}\right)$
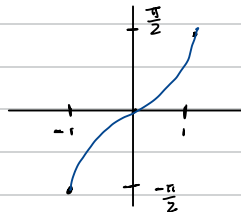
   $(Sin\,x + Cos\,x)^2 = Sin^2 x + 2Sin\,x\,Cos\,x + Cos^2 x = 1 + Sin(2x)$
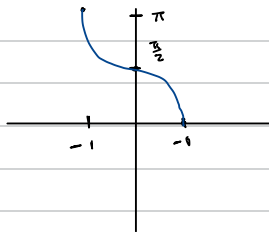
Trig Inverses

$Sin^{-1}(x)$

Domain $[-1, 1]$

Range $[0, \pi]$

$Cos^{-1}(x)$

Domain $[-1, 1]$
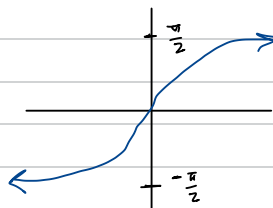
Range $[0, \pi]$

$tan^{-1}(x)$

Domain $(-\infty, \infty)$

Range $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

Since some of these functions have restricted domains, when solving equations, they may require "plus thinking"