

WS #5-3

Properties of Trig functions

1. Domain and Range:

Function	Symbol	Domain	Range
sine	$\sin \theta$	D: $\mathbb{R}$	R: $[-1, 1]$
cosine	$\cos \theta$	D: $\mathbb{R}$	R: $[-1, 1]$
tangent	$\tan \theta$	D: $\mathbb{R}$ except odd int mult of $\frac{\pi}{2}$	R: $\mathbb{R}$
cosecant	$\csc \theta$	D: $\mathbb{R}$ except int mult of $\pi$	R: $(-\infty, -1] \cup [1, \infty)$
secant	$\sec \theta$	D: $\mathbb{R}$ except odd int mult of $\frac{\pi}{2}$	R: $(-\infty, -1] \cup [1, \infty)$
cotangent	$\cot \theta$	D: $\mathbb{R}$ except int mult of $\pi$	R: $\mathbb{R}$

2. Period - Distance traveled along x-axis before the trig function's graph starts to repeat itself

Periodic Properties

$$\sin(\theta + 2\pi) = \sin \theta$$

$$\csc(\theta + 2\pi) = \csc \theta$$

$$\cos(\theta + 2\pi) = \cos \theta$$

$$\sec(\theta + 2\pi) = \sec \theta$$

$$\tan(\theta + \pi) = \tan \theta$$

$$\cot(\theta + \pi) = \cot \theta$$

3. Fundamental Identities

Reciprocal Identities

$$\csc \theta = \frac{1}{\sin \theta} \quad \sec \theta = \frac{1}{\cos \theta} \quad \cot \theta = \frac{1}{\tan \theta}$$

Quotient Identities

$$\tan \theta = \frac{\sin \theta}{\cos \theta} \quad \cot \theta = \frac{\cos \theta}{\sin \theta}$$

Pythagorean Identities

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

Even-Odd Identities

$$\sin(-\theta) = -\sin \theta \quad \cos(-\theta) = \cos \theta \quad \tan(-\theta) = -\tan \theta$$

$$\csc(-\theta) = -\csc \theta \quad \sec(-\theta) = \sec \theta \quad \cot(-\theta) = -\cot \theta$$