Week 11 Trigonometric Functions Lecture Note

Notebook:	Computational Mathematics		
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Cornell Notes	**Topic:** Trigonometric Functions	Course: BSc Computer Science Class: Computational Mathematics[Lecture] Date: July 03, 2020

Essential Question:

What is the unit circle and the various trig functions associated with it?

Questions/Cues:

- What are the trig functions for a right angle triangle?
- How do we consider the trig functions for angles greater than 90 degrees?
- How do the sine and cosine change signs change across the four quadrants established by the unit circle?
- What are some special angles when mentioning the unit circle?
- What are the other trig functions and the inverse trig functions?
- What are the properties of trig functions?

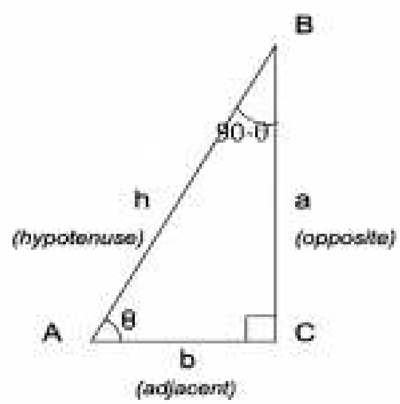
Notes

From right triangles we defined.

1) $\text{Sin}(\theta)=a/h=\frac{opposite}{hypotenuse}$

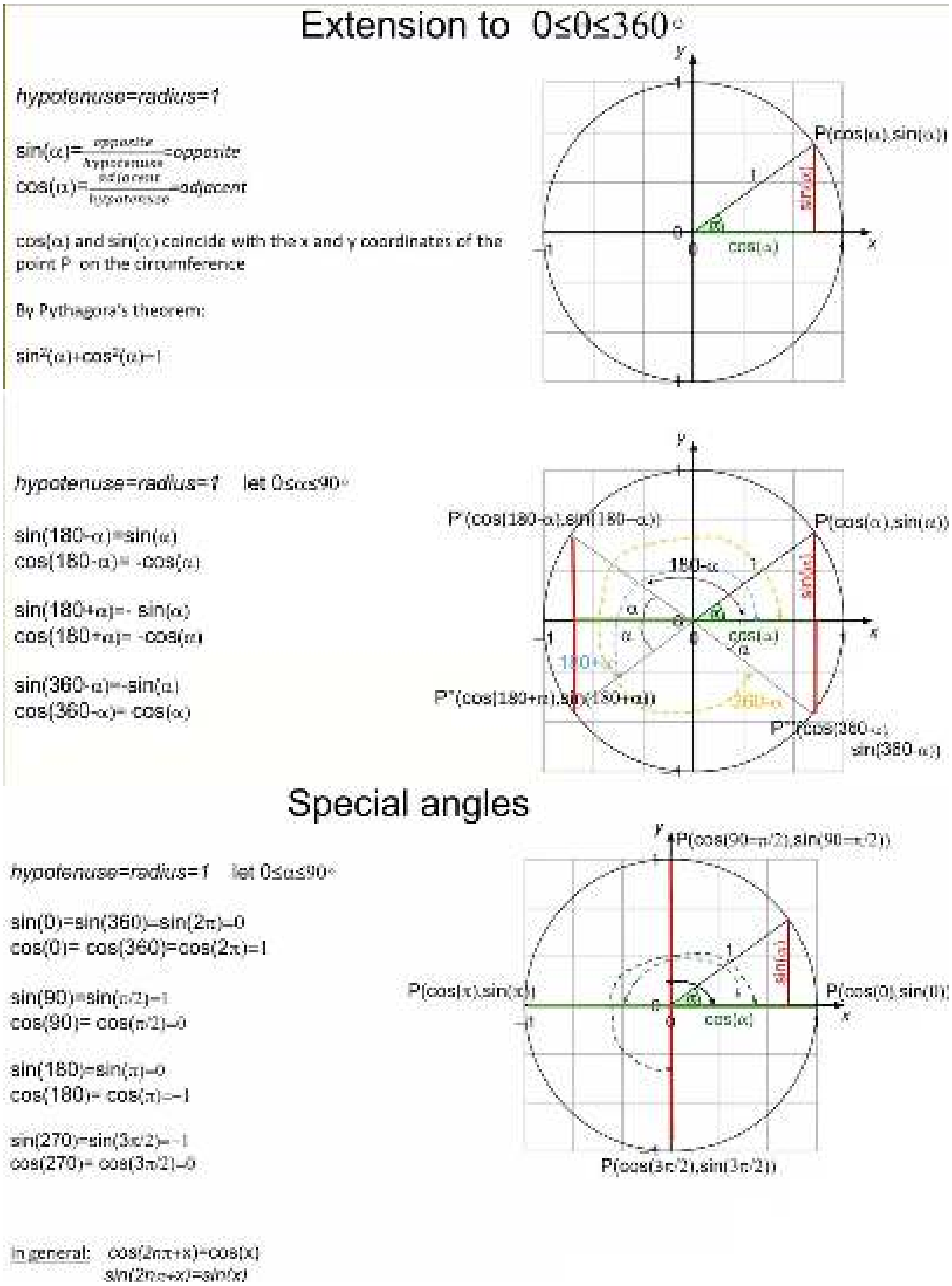
2) $\text{Cos}(\theta)=b/h=\frac{adjacent}{hypotenuse}$

3) $\text{Tan}(\theta)=a/b=\frac{opposite}{adjacent}$



Limited to angles $0\leq\theta\leq90^{\circ}$

- Where the other two angles expect the 90 degree angle have to add up to 90 degrees because the sum of the all the internal angles must be equal to 180 degrees



- sine and cosine both are periodic after 360 degrees or 2 pi radians, which means they repeat.

Definitions

Secant : $\sec(\theta) = 1/\cos(\theta)$

Cosecant: $\csc(\theta) = 1/\sin(\theta)$

Cotangent: $\cot(\theta) = 1/\tan(\theta)$

Inverse functions: if $y=f(x) \rightarrow x=f^{-1}(y)$ <u>f must be bijective</u>

ArcSin: if $\text{Sin}(\theta)=y \rightarrow \theta=\text{Sin}^{-1}(y)=\text{ArcSin}(y)$

ArcCos: if $\text{Cos}(\theta)=y \rightarrow \theta=\text{Cos}^{-1}(y)=\text{ArcCos}(y)$

ArcTan: if $\text{Tan}(\theta)=y \rightarrow \theta=\text{Tan}^{-1}(y)=\text{ArcTan}(y)$

Properties

$\cos(\alpha+\beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta \quad \rightarrow \quad \cos(2\alpha) = \cos^2\alpha - \sin^2\alpha$

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

$\sin(\alpha+\beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta \quad \rightarrow \quad \sin(2\alpha) = 2\sin\alpha\cos\alpha$

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

$\sin(\alpha/2) = \sqrt{\frac{1-\cos(\alpha)}{2}}$

$\cos(\alpha/2) = \sqrt{\frac{1+\cos(\alpha)}{2}}$

Summary

In this week, we learned about the unit circle, the trig functions for angles greater than 90 degrees, the fundamental identity of trigonometry, special trig angles, inverse trig functions and the properties of trig functions.