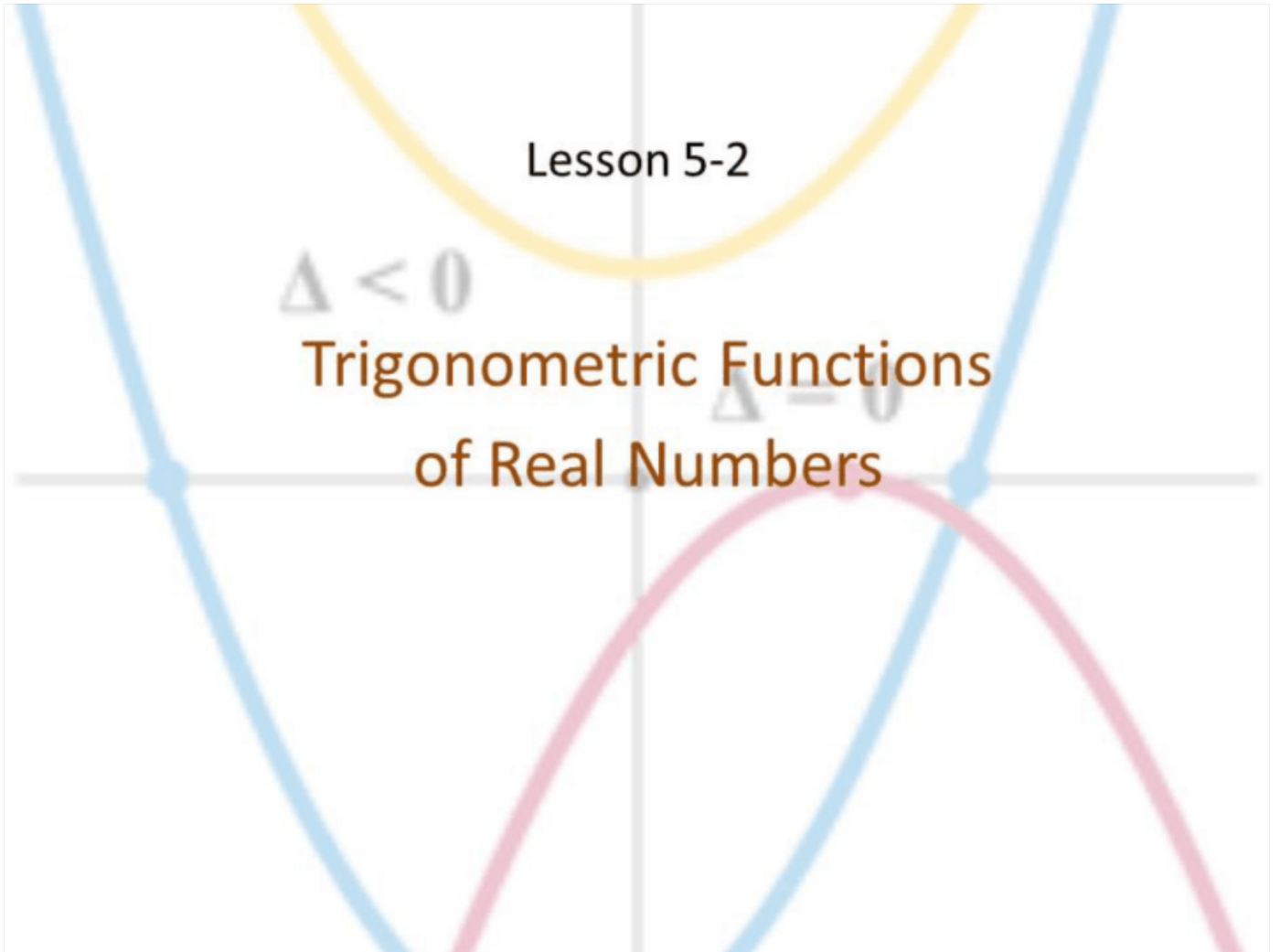


Lesson 5-2

$\Delta < 0$

Trigonometric Functions
of Real Numbers

$\Delta = 0$



Objective

Students will...

- Be able to know that the coordinates of radians, $(x, y) = (\cos t, \sin t)$
- Be able to evaluate trigonometric functions in radians.

60°

soh cah toa.

Trigonometric Functions



The concept of trigonometric functions can be defined in terms of the unit circle. The **definition of trigonometric functions** is as follows:

$t = \text{deg.}, \text{radians}$
 (x, y)

$$\tan = \frac{\sin}{\cos}$$

$$\cos t = x$$

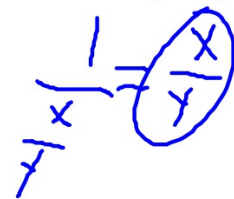
$$\sin t = y$$

$$\tan t = \frac{y}{x} \quad (x \neq 0)$$

$$\sec t = \frac{1}{\cos t} = \frac{1}{x} \quad (x \neq 0)$$

$$\csc t = \frac{1}{\sin t} = \frac{1}{y} \quad (y \neq 0)$$

$$\cot t = \frac{1}{\tan t} = \frac{x}{y} \quad (y \neq 0)$$



Evaluating Trigonometric Functions

We have computed the (x, y) coordinate for each of the values on the unit circle. Based on our definition above, $(x, y) = (\cos t, \sin t)$.

Consider the following units on the unit circle (Note that we are in radians):

$0 = (1, 0)$ → $\cos 0 = 1$, $\sin 0 = 0$, $\tan 0 = \frac{0}{1} = 0$

$\frac{\pi}{4} = \left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$ → $\cos \frac{\pi}{4} = \frac{\sqrt{2}}{2}$, $\sin \frac{\pi}{4} = \frac{\sqrt{2}}{2}$, $\tan \frac{\pi}{4} = 1$

$\sec \frac{\pi}{4} = \frac{2}{\sqrt{2}} = \sqrt{2}$, $\csc \frac{\pi}{4} = \frac{2}{\sqrt{2}} = \sqrt{2}$, $\cot \frac{\pi}{4} = \frac{1}{1} = 1$

$$\frac{\pi}{3} = \left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right) \rightarrow \cos \frac{\pi}{3} = \frac{1}{2} \quad \sin \frac{\pi}{3} = \frac{\sqrt{3}}{2} \quad \tan \frac{\pi}{3} = \frac{\sqrt{3}}{2} \div \frac{1}{2} = \sqrt{3}$$

$$\sec \frac{\pi}{3} = \frac{1}{\frac{1}{2}} = 2$$

$$\csc \frac{\pi}{3} = \frac{1}{\frac{\sqrt{3}}{2}} = \frac{2\sqrt{3}}{3}$$

$$\cot \frac{\pi}{3} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

~~$$\frac{\pi}{4} = (,) \rightarrow$$~~



$$\frac{\pi}{2} = (0, 1) \rightarrow \cos \frac{\pi}{2} = 0 \quad \sin \frac{\pi}{2} = 1 \quad \tan \frac{\pi}{2} = \frac{1}{0}$$
~~$$\sec \frac{\pi}{2} = \frac{1}{0}$$~~
~~$$\csc \frac{\pi}{2} = \frac{1}{1} = 1$$~~
~~$$\cot \frac{\pi}{2} = \frac{0}{1} = 0$$~~

$$\frac{2\pi}{3} = \left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right) \rightarrow \cos \frac{2\pi}{3} = -\frac{1}{2} \quad \sin \frac{2\pi}{3} = \frac{\sqrt{3}}{2} \quad \tan \frac{2\pi}{3} = \frac{\sqrt{3}}{-\frac{1}{2}} = -2\sqrt{3}$$

$$\sec \frac{2\pi}{3} = -2 \quad \csc \frac{2\pi}{3} = \frac{2}{\sqrt{3}}$$

$$\frac{5\pi}{4} = (\quad , \quad) \rightarrow$$

$$\cot \frac{2\pi}{3} = \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

$$\frac{3\pi}{2} = (\quad , \quad) \rightarrow$$

$$\frac{11\pi}{6} = (\quad , \quad) \rightarrow$$

csc, sec, cot

For the following, give the values for $\csc t$, $\sec t$, and $\cot t$

$$\frac{4\pi}{3} = (\quad , \quad)$$

Homework 12/16

TB pg. 416 #3, 4, 8, 9, 14, 18