Warm Up 1/07

No calculators allowed.

$\frac{\pi}{3} = \left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$

III

1. $\sin\frac{4\pi}{3} = \boxed{-\frac{\sqrt{3}}{2}}$

$\frac{4}{3} > 1 \quad \frac{4}{3} = 1\boxed{\frac{1}{3}} < \frac{1}{2}$

$\frac{\pi}{4} = \left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

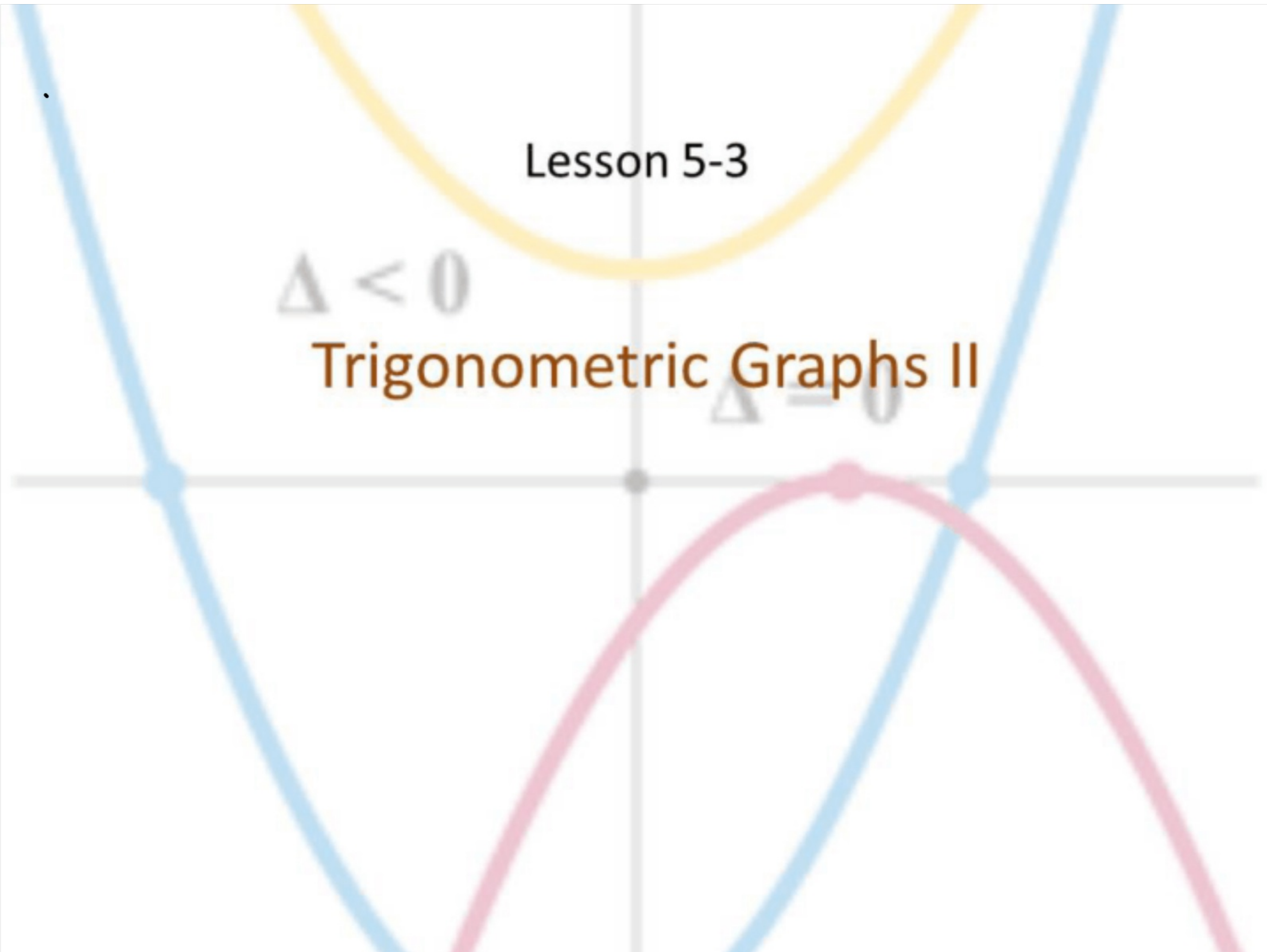
II

2. $\cos\frac{3\pi}{4} = \boxed{-\frac{\sqrt{2}}{2}}$

$\frac{3}{4} < 1$

3. What does it mean for a function to have a period of $\frac{3\pi}{4}$?

length of the cycle is $\frac{3\pi}{4}$


Lesson 5-3
Δ < 0
Trigonometric Graphs II
Δ = 0

Objective

Students will…

- Be able to know what the standard equation of a sine and a cosine curve is.
- Be able to find the period and the amplitude of a sine or a cosine function algebraically.

Periodic Behavior of sin and cos

Before we can graph sin and cos functions, we need to take a closer look at their behavior.

One common behavior that we can quickly spot for any trigonometric function is the **repetition** of the values.

Ex: $\sin 0 = 0 = \sin 2\pi$, $\sin \frac{\pi}{2} = 1 = \sin \frac{5\pi}{2}$, etc.

$\cos 0 = 1 = \cos 2\pi$, $\cos \frac{\pi}{2} = 0 = \cos \frac{5\pi}{2}$, etc.

For this reason, sin and cos functions are said to be **periodic**. This is why the unit circle is perfect for representing their values, because every circle is periodic (i.e. comes back to its starting point).

Standard Equation of Sine and Cosine Curves

Like any other functions, there exists a standard equation of both sine and cosine curves.

$y = 3\cos 4x$

$a = 3$
$k = 4$

Sine Curves: Any equation of a sine curve is written in the form:

$y = a \sin kx$, where a and k are real numbers with $k > 0$

Cosine Curves: Any equation of a cosine curve is written in the form:

$y = a \cos kx$, where a and k are real numbers with $k > 0$

$y = \pi \cos 3\pi x$

$a = \pi$

$k = 3\pi$

Period and Amplitude of Sine and Cosine Curves

In our previous lesson we simply used the graph to figure out the period and amplitude of a given sine or cosine curve. However, we may not (more of than not) have a graph to refer to. In fact, how would we find the period if we were asked to graph a given sine or cosine curve? Of course, we can use the x-y table to graph the curve first, but this isn't always practical.

Fortunately, finding the period and the amplitude of a sine or cosine curve can be found algebraically from their equation.

For sine and cosine curves: $y = a\sin kx$ and $y = a\cos kx$,

$y = \sin t$ $y = \cos t$

Period = $\frac{2\pi}{k}$ **Amplitude** = $|a|$

Examples

Find the period and amplitude of each function.

$a = 4$
$k = 3$

1. $y = 4\cos 3x$

Per: $\frac{2\pi}{k} = \boxed{\frac{2\pi}{3}}$

Amp: $|a| = |4| = \boxed{4}$

$a = -2$
$k = 1/2$

2. $y = -2\sin\frac{1}{2}x$

Per: $\frac{2\pi}{1/2} = 2\pi \cdot 2 = \boxed{4\pi}$

Amp: $|-2| = \boxed{2}$

$\frac{2}{4} = \frac{1}{2}$

3. $y = 2\cos 3x$

Per: $\frac{2\pi}{3}$

Amp: 2

4. $y = \pi\sin 4x$

Per: $\frac{\pi}{2}$

Amp: $|\pi| = \pi$

Homework 1/07

TB pg. 429 #15-24 (ONLY FIND PERIOD AND AMPLITUDE) **DO NOT GRAPH!**