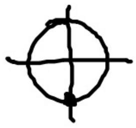
Warm Up 1/06



- No calculators allowed.

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

II y

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

$\frac{2}{3} < 1$

$\frac{\square}{6} = \left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$

2. $\cos\frac{11\pi}{6} = \boxed{\frac{\sqrt{3}}{2}}$

$\frac{11}{6} > 1$

$\frac{11}{6} = 1\boxed{\frac{5}{6}}$ IV.

3. If $\cos t = \frac{3}{5}$ and t is in quadrant IV, find the values of all other trigonometric functions at t.

$\cos^2 t + \sin^2 t = 1$

$\cos t = \frac{3}{5}$

$\sin t = -\frac{4}{5}$

$\tan t = -\frac{4}{3}$

$\cot t = -\frac{3}{4}$

$\csc t = -\frac{5}{4}$

$\sec t = \frac{5}{3}$

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

$= \frac{-\frac{4}{5}}{\frac{3}{5}}$

$= -\frac{4}{\cancel{5}} \cdot \frac{\cancel{5}}{3}$

$= -\frac{4}{3}$

$\sin t = \pm\sqrt{1 - \cos^2 t}$

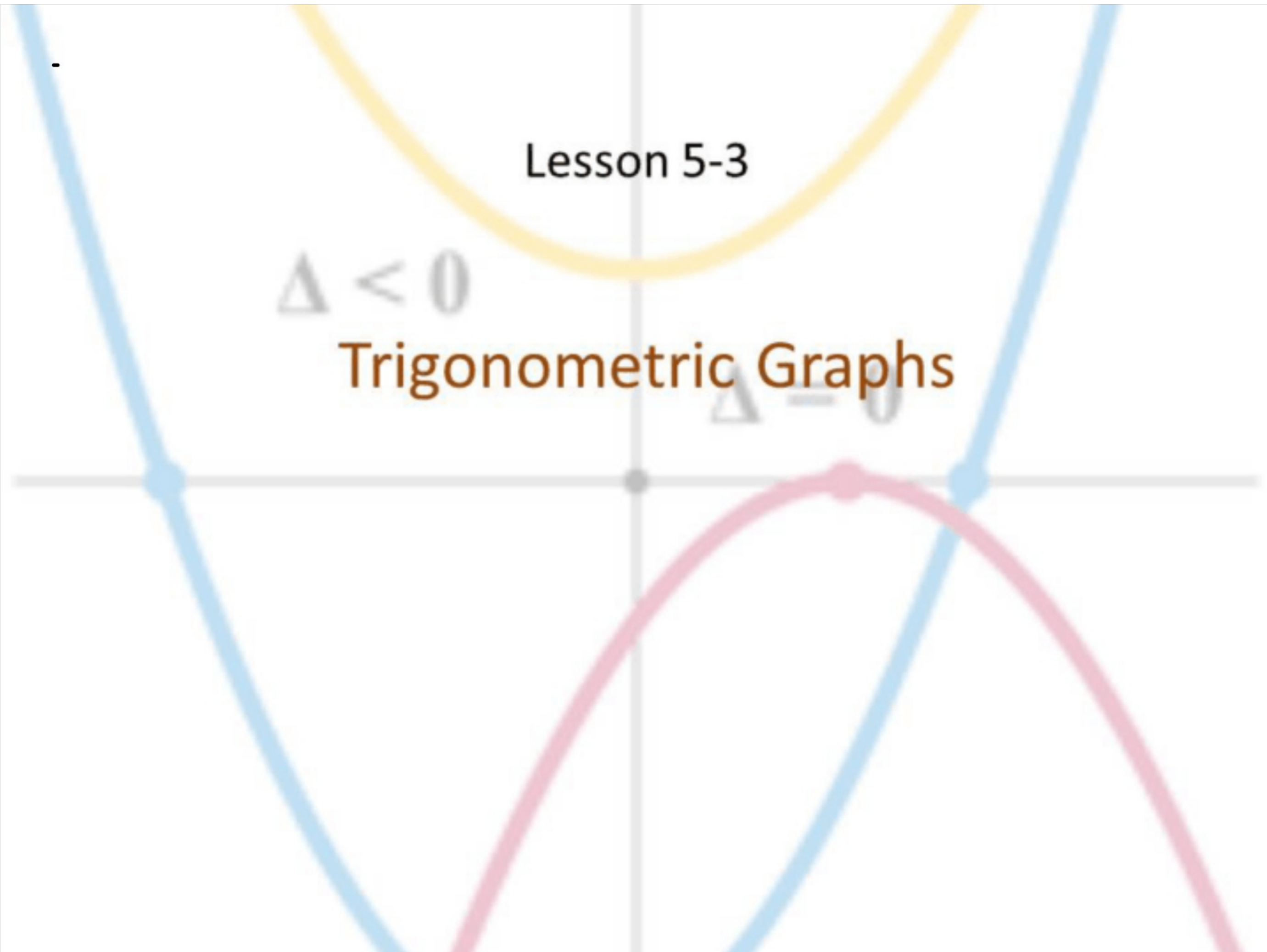
$\sin t = \pm\sqrt{1 - \left(\frac{3}{5}\right)^2} = \pm\sqrt{1 - \frac{9}{25}}$

$= \pm\sqrt{\frac{16}{25}}$

$= -\frac{4}{5}$

$\frac{25}{25} - \frac{9}{25}$

$= \frac{16}{25}$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Lesson 5-3
Δ < 0
Trigonometric Graphs

Objective

Students will…

- Be able to understand that sin and cos graphs are periodic.
- Be able to define period and amplitude of sin and cos graphs.

Trigonometric Functions

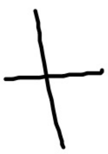
The concept of trigonometric functions can be defined in terms of the **unit circle**. The definition of trigonometric functions is as follows:

$$\cos t = x \qquad \sin t = y \qquad \rightarrow \qquad (x, y) = (\cos t, \sin t)$$

While the unit circle allows us to better understand the **coordinates** and the **real number values** of trigonometric functions at a certain radian or degree, it does not give us an adequate visualization of their behavior.

$y = 2\cos t$

For this purpose, we need to graph them on a **plane** just like any other functions.

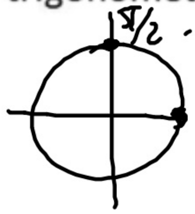


Periodic Behavior of sin and cos

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.

$\frac{5}{2} = 2\frac{1}{2}$



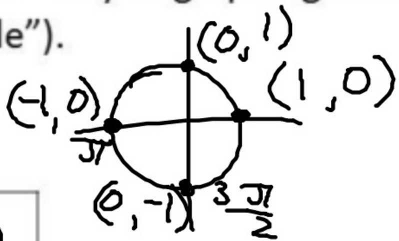
Ex: $\sin 0 = 0 = \sin 2\pi, \sin\frac{\pi}{2} = 1 = \sin\frac{5\pi}{2}$, etc.

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

Graphing sin and cos functions

The most “classic” way of graphing making and using a table of values (i.e. the “xy-table”).



$\sin t$

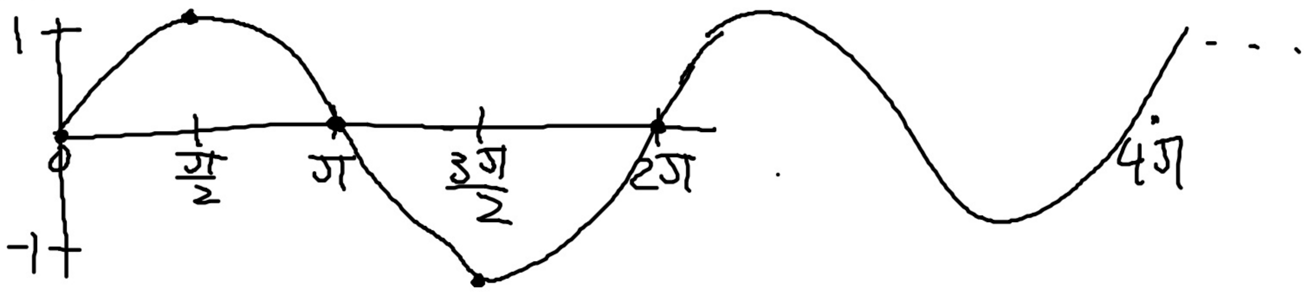
x	y
0	0
$\frac{\pi}{2}$	1
π	0
$\frac{3\pi}{2}$	-1
2π	0

$\cos t$

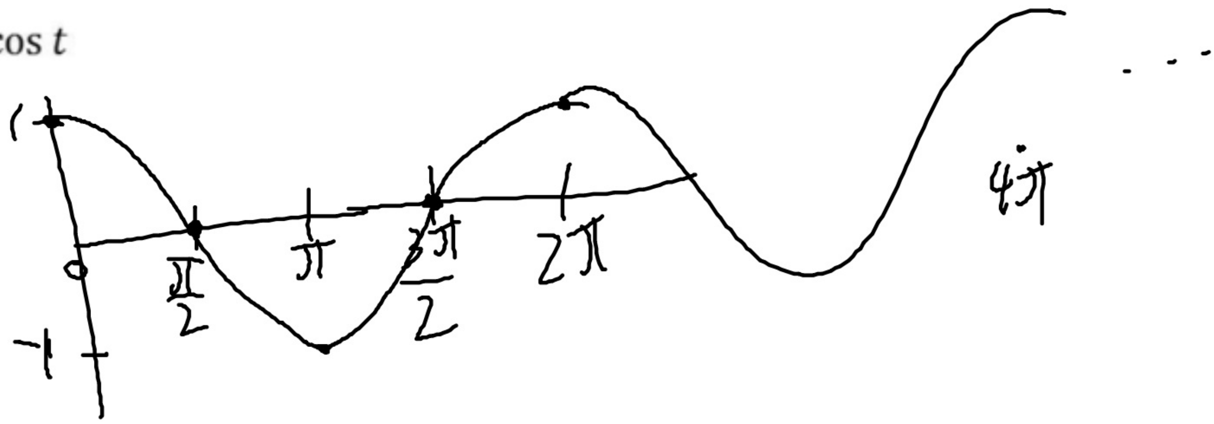
x	y
0	1
$\frac{\pi}{2}$	0
π	-1
$\frac{3\pi}{2}$	0
2π	1

Let us now graph the two functions.

$\sin t$



$\cos t$



Period of sin and cos

As mentioned, the graph of these two trigonometric functions give us a good visualization of their behaviors and characteristics. We can see that standard cos and sin graphs have a period of $\mathbf{2\pi}$. In other words, their graphs repeat in increments of 2π.

With that said, not all sin and cos functions have period 2π. For now, the key is simply looking at their graphs to see how much they repeat at a time.

Amplitude of sin and cos

Going back to our sin and cos graphs, we can also see that each graph has a highest point. This is called the **amplitude** of the function. Note that since sin and cos functions are **periodic**, once we know what their highest point is, we can naturally find their lowest point. Hence, we only need to really focus on the highest point of the graph.

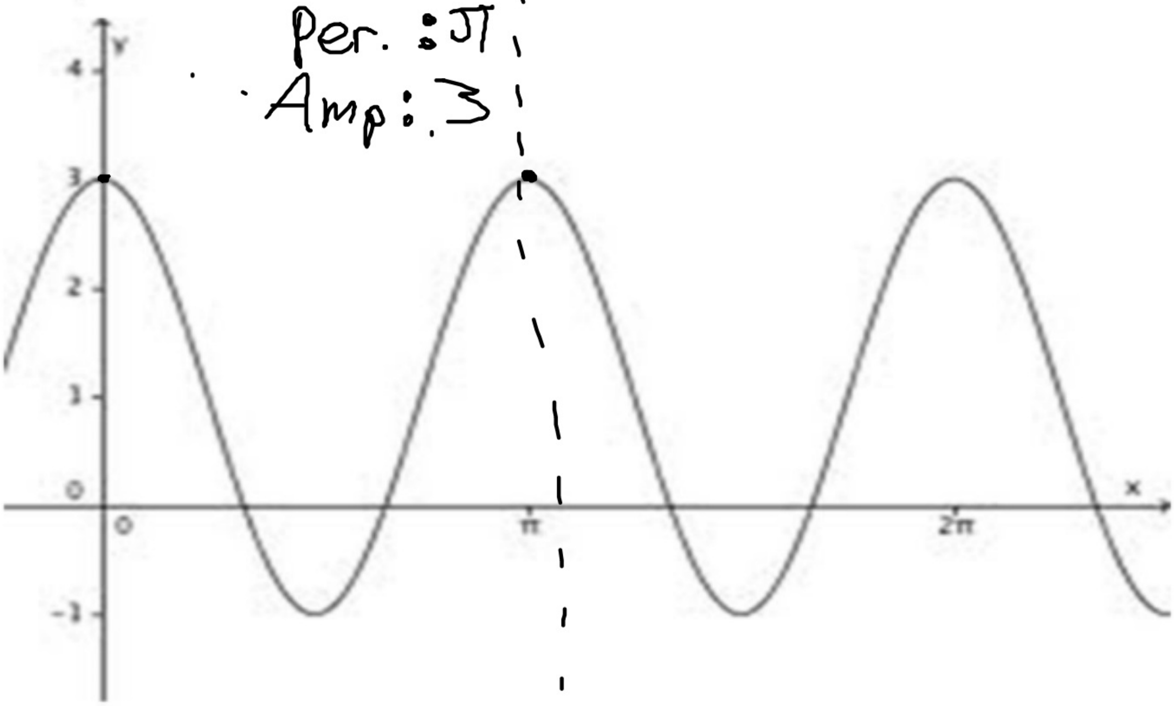
Similar to their period, not all sin and cos function will have the same amplitude. For the time being, we only need to look at their graph and simply locate the highest point. Keep in mind that their graphs will reach this highest point multiple times since they are, well, periodic!

Examples

Determine whether the graph is sin or cos, and find its period and amplitude.

Per. : π

Amp: 3

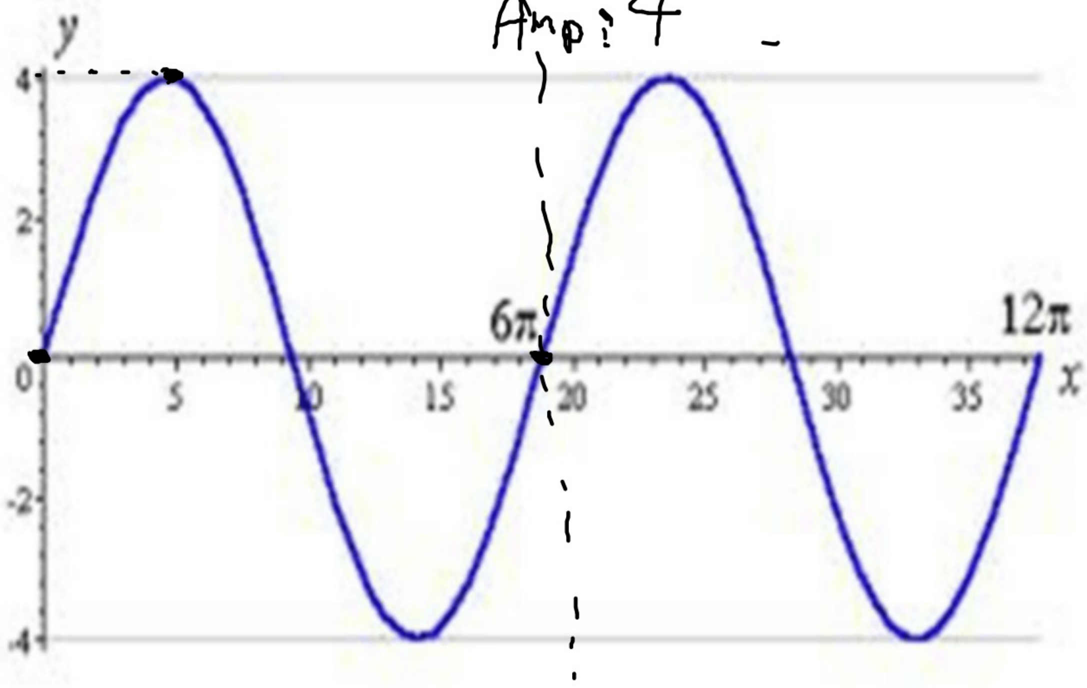


Examples

Determine whether the graph is sin or cos, and find its period and amplitude.

Per. : 6π

Amp : 4



Homework 1/06

Worksheet: Identify amplitude and period **ONLY!!**