Lesson 53: Graphing Trig Functions

By the end of the lesson, we will be able to:

~Find the Amplitude and Period
~Graph Sine and Cosine functions

Graphing Trig Functions

$$y = a \sin b(x - h) + k$$
$$y = a \cos b(x - h) + k$$

Transformations of trig functions:

a gives **amplitude** (vertical stretch); if a is negative, the graph is flipped upside down

b gives **period** (horizontal stretch), use the formula: period $= \dfrac{2\pi}{b}$

h gives the horizontal shift, called **phase shift**

k gives the **vertical shift**

* This year, we are not going to worry about h and k.

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Example 1: Graph the following trig function.

θ (radians)	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π
$\cos \theta$ (decimal)											

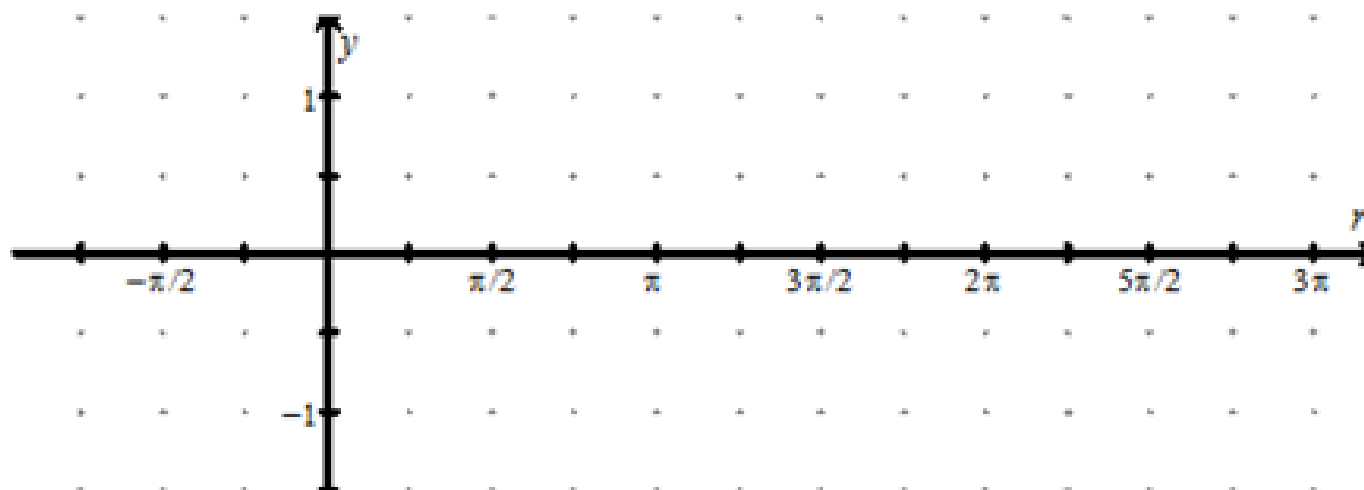$y = \cos \theta$

Amplitude:

Period:

Critical Values:

Domain: Range:

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Reminder: Critical Values for Trig Functions are the

   * High points on the wave.
   * Low points on the wave.
   * The points where the wave crosses the x-axis.

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Example 2: Graph the following trig function.

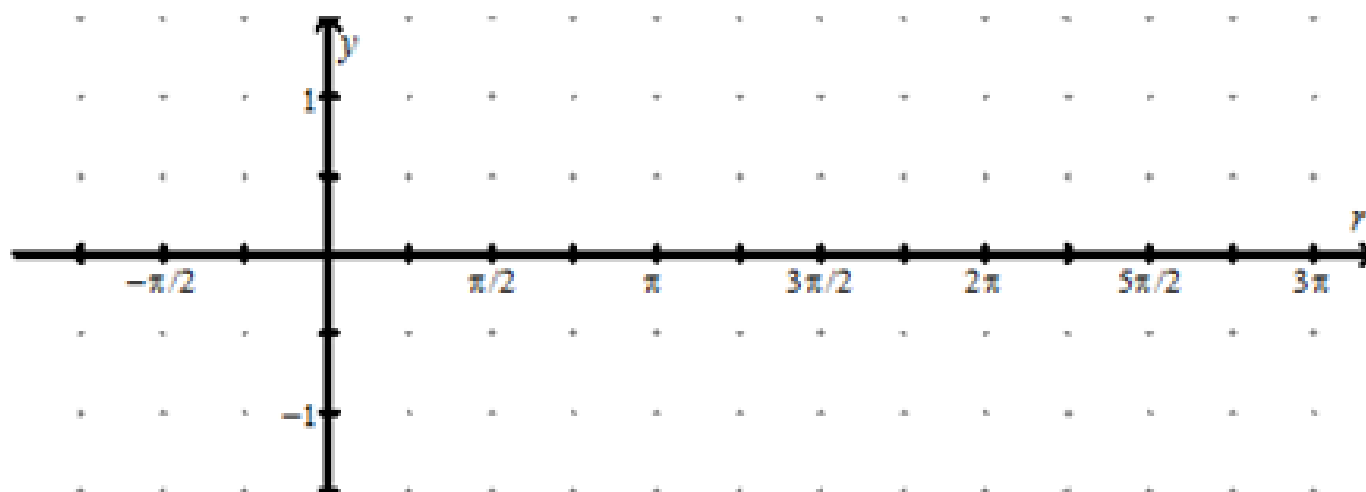| θ (radians)	0	$\dfrac{\pi}{6}$	$\dfrac{\pi}{4}$	$\dfrac{\pi}{3}$	$\dfrac{\pi}{2}$	$\dfrac{3\pi}{4}$	π	$\dfrac{5\pi}{4}$	$\dfrac{3\pi}{2}$	$\dfrac{7\pi}{4}$	2π
$\sin\theta$ (decimal)											

$$y = \sin\theta$$

Amplitude:

Period:

Critical Values:

Domain: Range:

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Example 3: State the Amplitude and Period of each function.

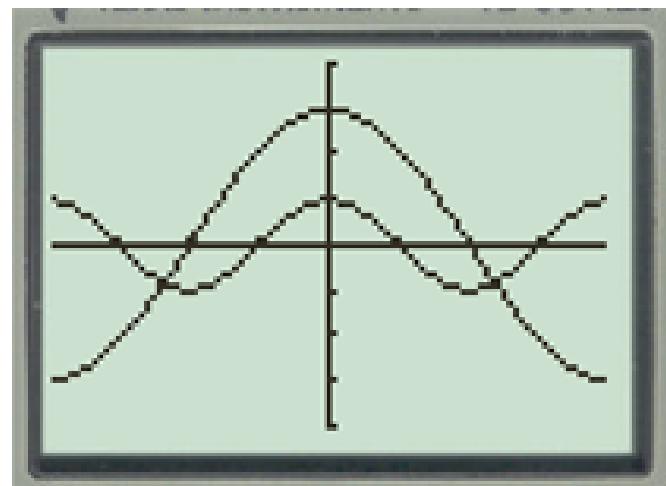a.) $y = 3 \cos \left(\frac{1}{2} \theta \right)$

Now graph $y = \cos \theta$ with $y = 3 \cos \left(\frac{1}{2} \theta \right)$ (Use Zoom #7)

What changed?

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Example 3: State the Amplitude and Period of each function.

a.) $y = 3\cos\left(\frac{1}{2}\theta\right)$

Now graph $y = \cos\theta$ with $y = 3\cos\left(\frac{1}{2}\theta\right)$ (Use Zoom #7)

What changed?

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Example 3: State the Amplitude and Period of each function.
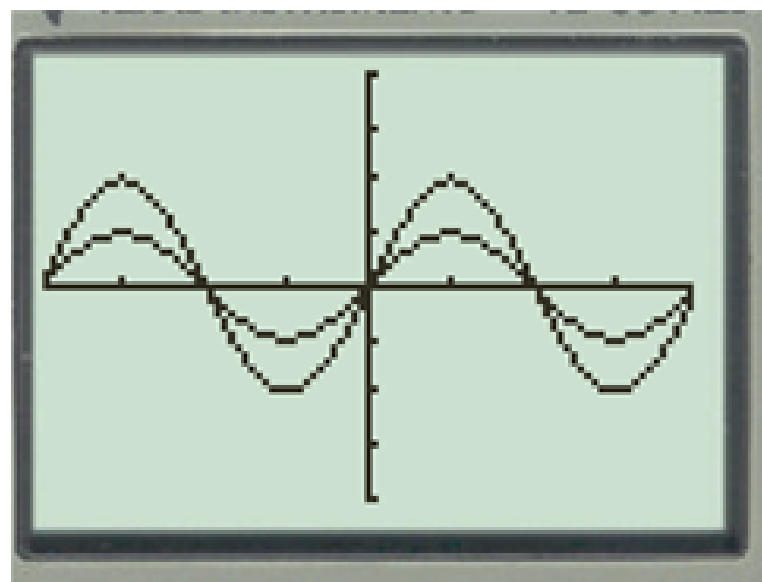
b.) $y = 2\sin\theta$

Now graph $y = \sin\theta$ with $y = 2\sin\theta$ (Use Zoom #7)

What changed?

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Example 3: State the Amplitude and Period of each function.

b.) $y = 2\sin\theta$

Now graph $y = \sin\theta$ with $y = 2\sin\theta$ (Use Zoom #7)

What changed?

Example 3: State the Amplitude and Period of each function.

c.) $y = 6 \cos\left(\frac{2}{3}\theta\right)$

What transfomations are going to occur?

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Steps to graph trig functions:
1. Identify amplitude and calculate the period.
2. If there is a vertical shift, sketch a line at y=k, along which the graph will oscillate.
3. Identify the start and end points of one period, and then the middle and quarter points. Graph the 5 critical values.

(Remember, if there is a flip upside-down, then the y's of the critical points change signs.)

4. Connect the critical points with a sine/cosine wave.
5. Continue the pattern for additional periods if there is space on the graph.

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Steps to get critical values:

1. Calculate the period. This will be your end point (the x-value).
2. Divide the period by 2. This will be your middle point (the x-value).
3. Divide the middle point value (from step 2) by 2. This will be the value between the start value and the middle value.
4. Take the values from step 2 and step 3 and add them together. This is your point between the middle point and the end point.

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Example 3: State the Amplitude and Period of each function. Now Graph! State the Domain and Range.

c.) $y = 6 \cos \left(\frac{2}{3} \theta \right)$

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Example 4: Graph the following trig function.

$$y = 5\cos 4\theta$$

Amplitude:

Period:

Domain:

Range:

Critical Values:

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Example 5: Graph the following trig function.

$$y = \frac{1}{2}\sin 2\theta$$

Amplitude:

Period:

Domain:

Range:

Critical Values:

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By the end of the lesson, we will be able to:

~Find the Amplitude and Period
~Graph Sine and Cosine functions

Can you?

<u>Lesson 53: Graphing Trig Functions</u>

<u>Homework:</u>

Assignment 53