Intro to Trig Graphs (Alg 2 Supp13.6 & 14.1)

Objective: To construct the parent graphs of trigonometric functions for sine, cosine, and tangent using exact values.

To graph the function $y = \sin\theta$, use values of θ expressed in either degrees or radians. These values represent the x values on a graph. Use the values of $\sin\theta$ expressed as a value rounded to the nearest tenth to represent the y values on the graph.

Ordered pairs for points on these graphs are of the form $(\theta, \sin\theta)$.

(0,0) (90,1) (180,0) (270,-1) (0,0)

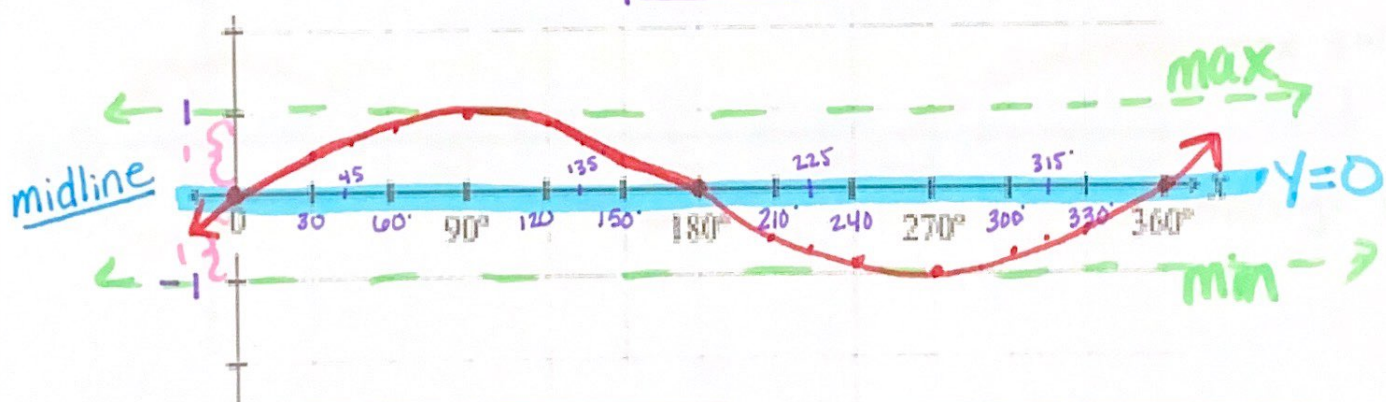
θ	0°	30°	45°	60°	90°	120°	135°	150°	180°	210°	225°	240°	270°	300°	315°	330°	360°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{3}}{2}$	-1	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{1}{2}$	0
nearest tenth	0	0.5	0.7	0.9	1	0.9	0.7	0.5	0	−0.5	−0.7	−0.9	−1	−0.9	−0.7	−0.5	0
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{3}}{2}$	-1	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{1}{2}$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
nearest tenth	1	0.9	0.7	0.5	0	−0.5	−0.7	−0.9	−1	−0.9	−0.7	−0.5	0	0.5	0.7	0.9	1
$\tan\theta$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	nd	$-\sqrt{3}$	-1	$-\frac{\sqrt{3}}{3}$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	nd	$-\sqrt{3}$	-1	$-\frac{\sqrt{3}}{3}$	0
nearest tenth	0	0.6	1	1.7	nd	−1.7	−1	−0.6	0	0.6	1	1.7	nd	−1.7	−1	−0.6	0
θ	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	2π

x
y
sin θ

nd = not defined

On the graph below, plot the points, $(\theta, \sin\theta)$. Connect the points with a smooth curve. This graph represents the graph of the sine function.

$\boxed{y = \sin\theta}$



Basic Characteristics:

Starts (0,0) midline

Amplitude= 1 (distance between midline to max or min)

Period (interval)= 360° or 2π goes through one period before it starts to repeat.

Music Have 5 Key Points

1. midline
2. max
3. mid line
4. min
5. mid line

Use the following table for $\cos\theta$.

(0,1) (90,0) (180,-1) (270,0) (360,1)

θ	0°	30°	45°	60°	90°	120°	135°	150°	180°	210°	225°	240°	270°	300°	315°	330°	360°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{3}}{2}$	-1	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{1}{2}$	0
nearest tenth	0	0.5	0.7	0.9	1	0.9	0.7	0.5	0	-0.5	-0.7	-0.9	-1	-0.9	-0.7	-0.5	0
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{3}}{2}$	-1	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{1}{2}$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
nearest tenth	1	0.9	0.7	0.5	0	-0.5	-0.7	-0.9	-1	-0.9	-0.7	-0.5	0	0.5	0.7	0.9	1
$\tan\theta$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	nd	$-\sqrt{3}$	-1	$-\frac{\sqrt{3}}{3}$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	nd	$-\sqrt{3}$	-1	$-\frac{\sqrt{3}}{3}$	0
nearest tenth	0	0.6	1	1.7	nd	-1.7	-1	-0.6	0	0.6	1	1.7	nd	-1.7	-1	-0.6	0
θ	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	2π

nd = not defined

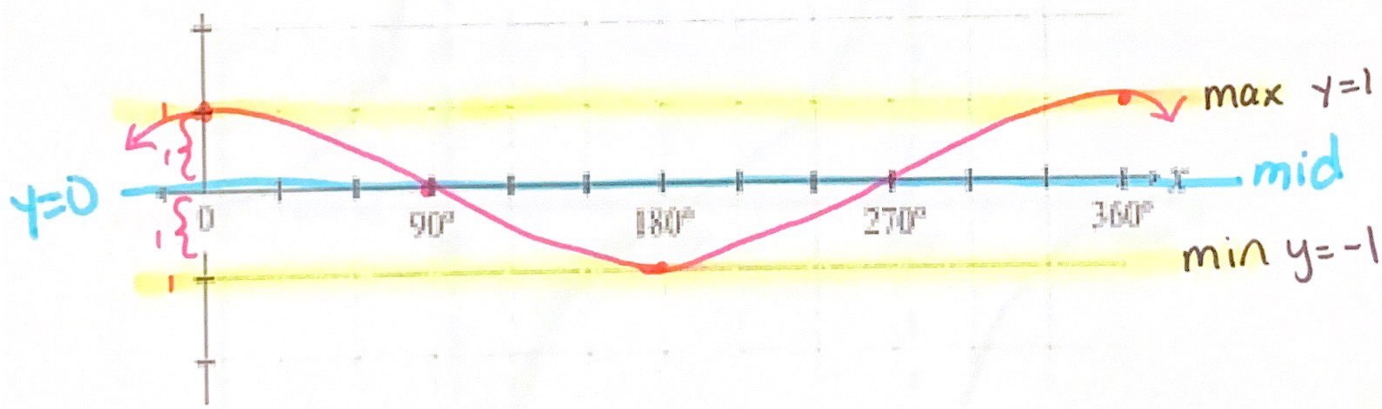
$\cos\theta$

To graph the function $y = \cos\theta$, use values of θ expressed in either degrees or radians. These values represent the x values on a graph. Use the values of $\cos\theta$ expressed as a value rounded to the nearest tenth to represent the y values on the graph.

Ordered pairs for points on these graphs are of the form $(\theta, \cos\theta)$.

On the graph below, plot the points, $(\theta, \cos\theta)$. Connect the points with a smooth curve. This graph represents the graph of the cosine function.

$$y = \cos\theta$$



Basic Characteristics:

Starts (0,1) max

Amplitude= 1

Period (interval)= 360° 2π goes through one period before it starts to repeat.

Music Have 5 Key Points

1. max
2. mid
3. min
4. mid
5. max

Complete the following table for $tan\ \theta$.

Boundry

$\frac{1}{0}$ $\frac{1}{0}$ (360,0)

θ	0°	30°	45°	60°	90°	120°	135°	150°	180°	210°	225°	240°	270°	300°	315°	330°	360°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{3}}{2}$	−1	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{1}{2}$	0
nearest tenth	0	0.5	0.7	0.9	1	0.9	0.7	0.5	0	−0.5	−0.7	−0.9	−1	−0.9	−0.7	−0.5	0
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{3}}{2}$	−1	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{1}{2}$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
nearest tenth	1	0.9	0.7	0.5	0	−0.5	−0.7	−0.9	−1	−0.9	−0.7	−0.5	0	0.5	0.7	0.9	1
$\tan\theta$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	nd	$-\sqrt{3}$	−1	$-\frac{\sqrt{3}}{3}$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	nd	$-\sqrt{3}$	−1	$-\frac{\sqrt{3}}{3}$	0
nearest tenth	0	0.6	1	1.7	nd	−1.7	−1	−0.6	0	0.6	1	1.7	nd	−1.7	−1	−0.6	0
θ	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	$\frac{11\pi}{6}$	2π

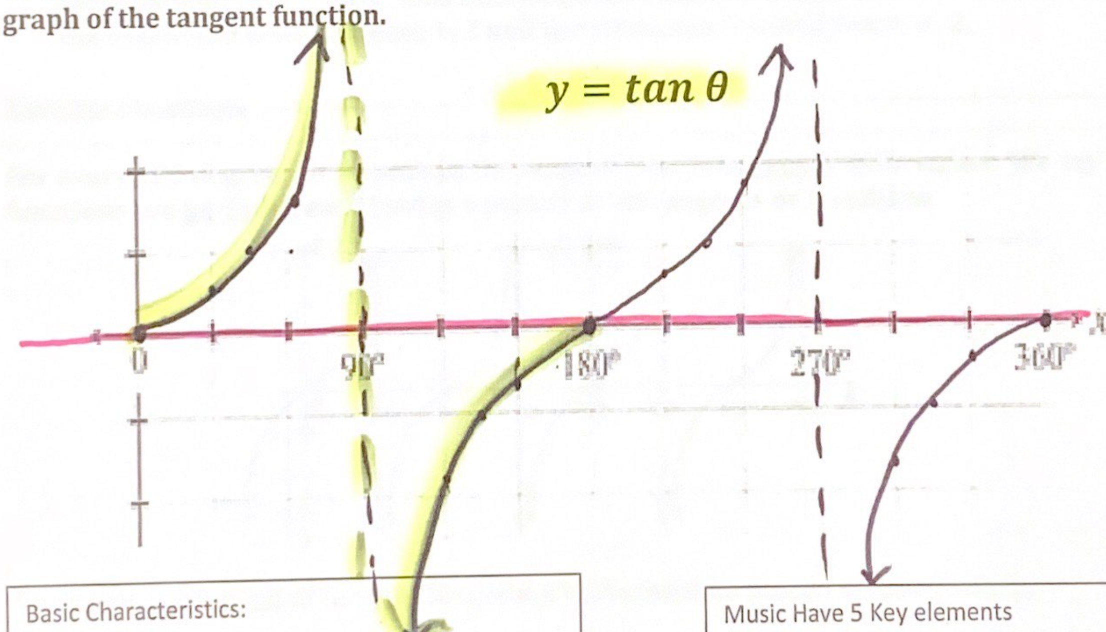
nd = not defined

To graph the function $y = tan\ \theta$, use values of θ expressed in either degrees or radians. These values represent the x values on a graph. Use the values of $tan\ \theta$ expressed as a value rounded to the nearest tenth to represent the y values on the graph.

Ordered pairs for points on these graphs are of the form $(\theta, tan\ \theta)$.

On the back plot the points, $(\theta, tan\ \theta)$. Connect the points with a smooth curve, but there should be breaks in the graph where there is an "error" or undefined value. This graph represents the graph of the tangent function.

$y = tan\ \theta$



Basic Characteristics:

Starts (0,0) mid

Amplitude= NA

Period (interval)= 180° or π goes through one period before it starts to repeat.

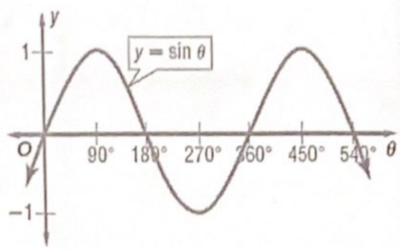
Music Have 5 Key elements

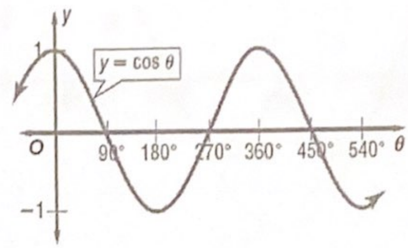
1. mid.
2. up
3. asymptote (Boundry Line
4. Below
5. mid

Name: ______________________________ Date: ________ Hour: _____

Changing Amplitude & Period
Sine & Cosine Functions

For every 360 degrees or 2π radians, the sine and cosine functions repeat their values. We say the sine and cosine functions are periodic, each having a period of 360 degrees or 2π radians.





To change the period of a sine and cosine function a value must be placed before theta, b.

For example, $y = \sin 2\theta$. This function would have a period of $\frac{360/2\pi}{b} = \frac{360/2\pi}{2} = 180^o or\ \pi$

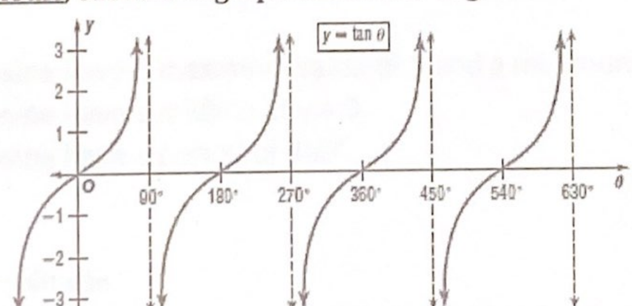
The amplitude is the midpoint from the highest point to the lowest point of the function. The graphs we constructed had an amplitude of 1.

To change the amplitude of a sine or cosine function the coefficient, a, must be changed.

For example, $y = 2\sin\theta$. This function would have an amplitude of 2. In other words, the maximum it would reach is 2 and the minimum it would reach is -2.

Tangent Functions

For every 180 degrees or π radians, the tangent functions repeat their values. We say the tangent functions are periodic, each having a period of 180 degrees or π radians.

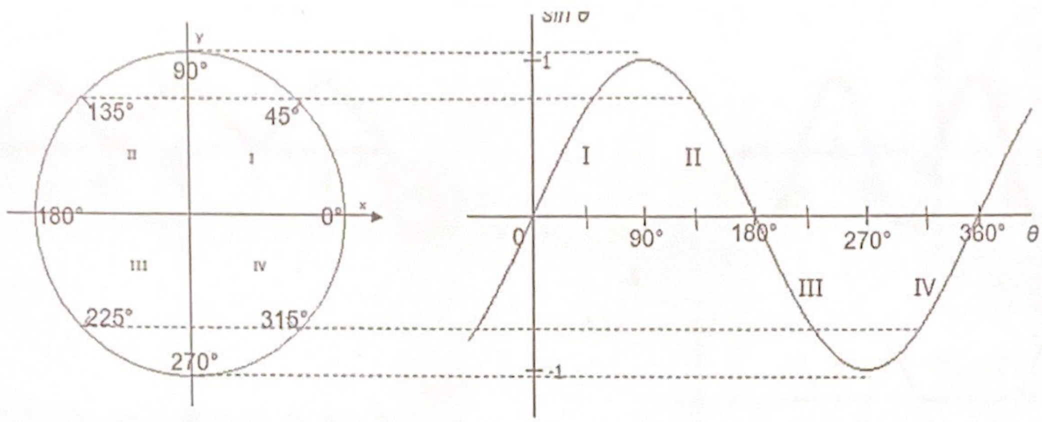


To change the period of tangent function a value must be placed before theta, b.

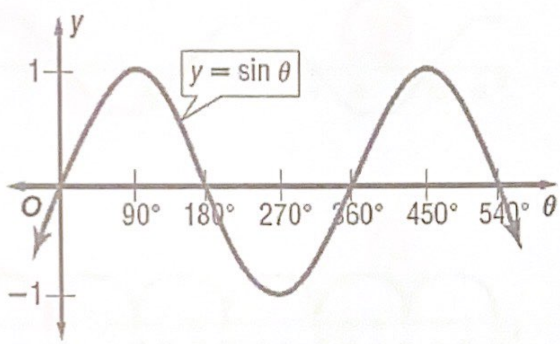
For example, $y = \tan 2\theta$. This function would have a period of $\frac{180/\pi}{b} = \frac{180/\pi}{2} = 90^o or\ \frac{\pi}{2}$

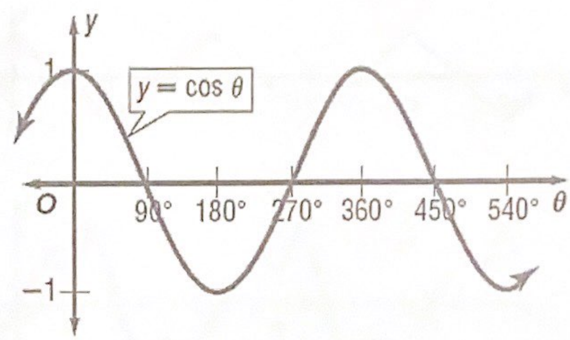
Because the tangent is infinite in both directions, the tangent function has no amplitude.

Look at a demonstration of this!



θ	$\sin\theta$
0	0
$\pi/2$	1
π	0
$3\pi/2$	−1
2π	0





Remember:

Both sine and cosine have a maximum value of 1 and a minimum value of -1.

Both sine and cosine have a midline at y = 0.

Both sine and cosine have a period of 360°.

Key Concept: Amplitude

The amplitude of the graph of a periodic function is the absolute vale of half the difference between its maximum value and its minimum value.

You try: Using the above information and your definition of amplitude, set up and expression as to how to time the amplitude of the graphs of the sine and cosine functions.