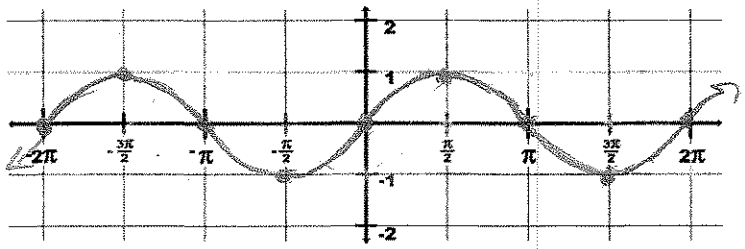
Graphing Sine and Cosine

Name: Key

1. Let y = sin x where x = angle in RADIANS. Fill in the table of values and plot on the coordinate plane below.

x	-2π	$-3\pi/2$	$-\pi$	$-\pi/2$	0	$\pi/2$	π	$3\pi/2$	2π
y=sin x	0	1	0	-1	0	1	0	-1	0

Connect these points in a SMOOTH curve. Do NOT make it pointy.
This is the shape of the y = sinx curve.



A periodic function is a function whose values repeat after a certain interval. The PERIOD refers to the length on the x axis that repeats itself.

Is y = sin x a PERIODIC function? Yes If so, what is the period? 2π

The AMPLITUDE of a function is found by $\frac{1}{2}$(max - min). What is the AMPLITUDE of y = sin x? 1

$\frac{1}{2}(1 - -1) = \frac{1}{2}(2) = 1$

On your calculator, change the MODE to Radians (not degrees). Under Y= put in sin x. Go to ZOOM and choose #7 (ZTrig). Note that the x-axis is from $[-2\pi, 2\pi]$.
This should have given you the graph you did above. Make sure it is correct and fix it if not.

Graph y =3sinx. Describe how this is different from y = sin x. What is the amplitude? Period?

3 2π

Graph y =-4 sin x. Describe how this is different from y = sin x. What is the amplitude? Period?

2π reflect over x-axis; y-values stretched by 4 4

Graph y = sin 2x. Describe how this is different from y = sin x. What is the amplitude? Period?

x values divided by 2 1 π

Graph y = sin $\frac{1}{2}$ x. Describe how this is different from y = sin x. What is the amplitude? Period?

4π x values multby 2 1

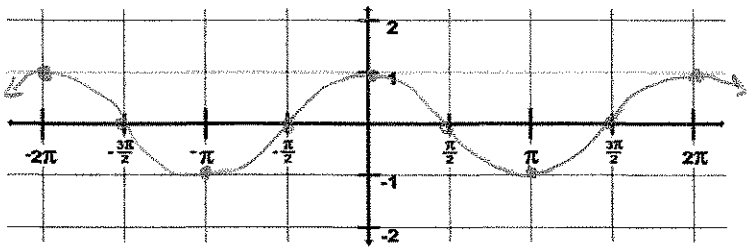
Let's generalize . . . if y = A sin Bx,

The AMPLITUDE is |A| **The PERIOD is** $\frac{2\pi}{|B|}$

2. Let y = cos x where x = angle in RADIANS. Fill in the table of values and plot on the coordinate plane below.

x	-2π	$-3\pi/2$	$-\pi$	$-\pi/2$	0	$\pi/2$	π	$3\pi/2$	2π
y=cos x	1	0	-1	0	1	0	-1	0	1

Connect these points in a SMOOTH curve. Do NOT make it pointy. This is the shape of the y = cos x curve.



A periodic function is a function whose values repeat after a certain interval. The PERIOD refers to the length on the x axis that repeats itself.

Is y = cos x a PERIODIC function? Yes If so, what is the period? 2π

The AMPLITUDE of a function is found by $\frac{1}{2}$(max - min). What is the AMPLITUDE of y = cos x?

1

On your calculator, make sure your MODE is set to Radians (not degrees). Under Y= put in **cos x**. Go to ZOOM and choose #7 (ZTrig). This should have given you the graph you did above. Make sure it is correct and fix it if not. Note that the x-axis is from $[-2\pi, 2\pi]$.

Graph y =4 cos x. Describe how this is different from y = cos x. What is the amplitude? 4
Period? 2π

Graph y =-3 cos x. Describe how this is different from y = cos x. What is the amplitude? 3
Period? 2π

Graph y = cos 4x. Describe how this is different from y = cos x. What is the amplitude? 1
Period? x divided by 4
$\pi/2$

Graph y = cos ½ x. Describe how this is different from y = cos x. What is the amplitude? 1
Period? 4π

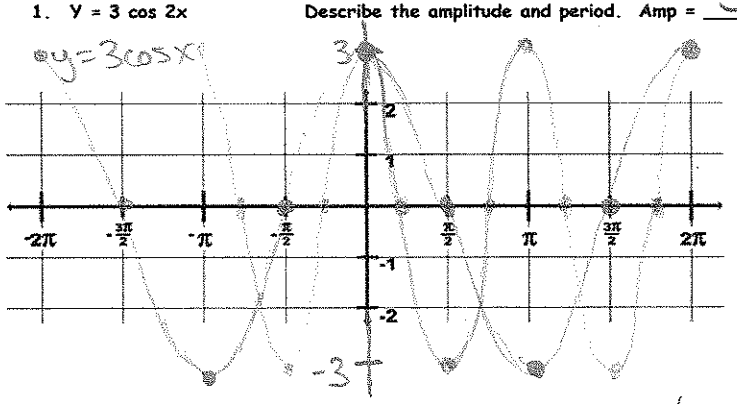
Let's generalize . . . if y = A cos Bx,

The AMPLITUDE is $|A|$ **The PERIOD is** $\frac{2\pi}{|B|}$

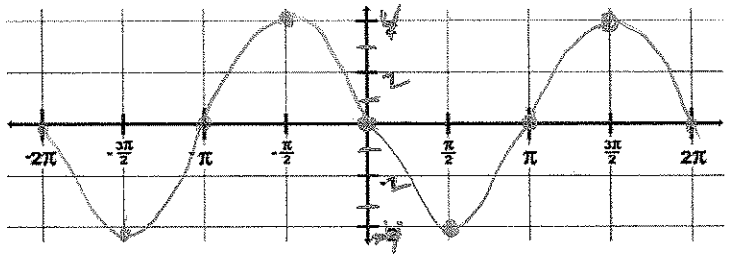
$\frac{2\pi}{2}$

SKETCH:

1. Y = 3 cos 2x **Describe the amplitude and period. Amp =** 3 **per=** π



2. Y = -4 sin x **Describe the amplitude and period. Amp =** 4 **per=** 2π



Give the amplitude and the period of the following:

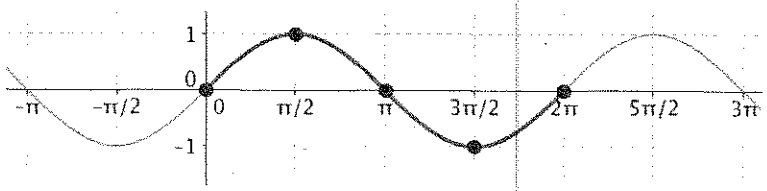
1. Y = 2 cos(4x)
amp = 2
period: $\frac{2\pi}{4} = \frac{\pi}{2}$

2. Y = $\frac{1}{3}\sin(\frac{1}{3}x)$
amp = 1
per: 6π

3. Y = $-\frac{1}{5}\cos(3x)$
amp = $\frac{1}{5}$
per: $\frac{2\pi}{3}$

Graphing Sine

Sine Function: y = sinx (amplitude =1, period = 2π)



We will graph the angle measure (the x value) in radians.
To graph by hand we will find 5 key points. These points are the maximum, the minimum, and the x-intercepts. We will usually graph only 1 cycle.

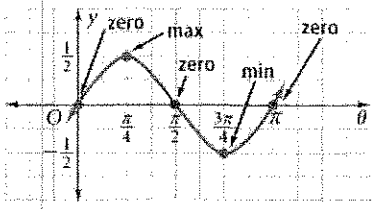
The graph of a sine function is called a **sine curve**.

For ***y = a sin bx*** with ***a≠ 0, b >0*** and **x in radians**:

- $|a|$ is the amplitude of the function
- if a is negative the graph flips over the x-axis
- b is the number of cycles in the interval 0 to 2π
- $\frac{2\pi}{b}$ is the period of the function

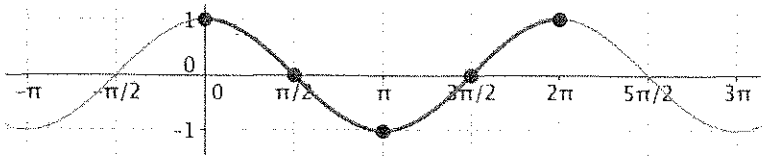
Example: Sketch one cycle of $y = \frac{1}{2}\sin 2x$

$|a| = ½$, so the amplitude is ½
$b = 2$ so there are 2 cycles from 0 to 2π
$\frac{2\pi}{b} = \frac{2\pi}{2} = \pi$ so the period is π
Divide the period into fourths.
Using the values of the amplitude and period plot the pattern zero-max-zero-min-zero.



Graphing Cosine

Cosine Function: y = cos x (amplitude =1, period = 2π)



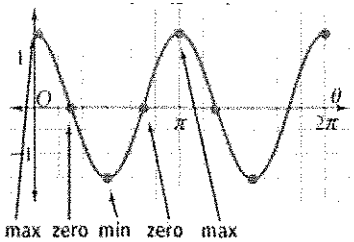
We will graph the angle measure (the x value) in radians.
To graph by hand we will find 5 key points. These points are the maximum, the minimum, and the x-intercepts. We will usually graph only 1 cycle.

For ***y = a cos bx*** with ***a≠ 0, b >0*** and **x in radians**:

- $|a|$ is the amplitude of the function
- if a is negative the graph flips over the x-axis
- b is the number of cycles in the interval 0 to 2π
- $\frac{2\pi}{b}$ is the period of the function

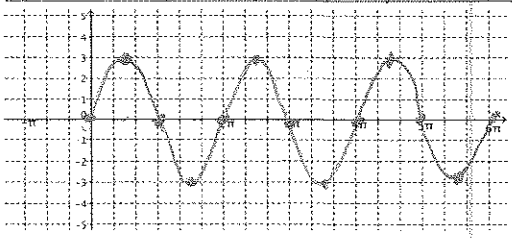
Example: Sketch one cycle of $y = 1.5\cos 2x$

$|a| = 1.5$, so the amplitude is 1.5
$b = 2$ so there are 2 cycles from 0 to 2π
$\frac{2\neq}{b} = \frac{2\neq}{2} = \neq$ so the period is π
Divide the period into fourths.
Using the values of the amplitude and period plot the pattern zero-max-zero-min-zero.

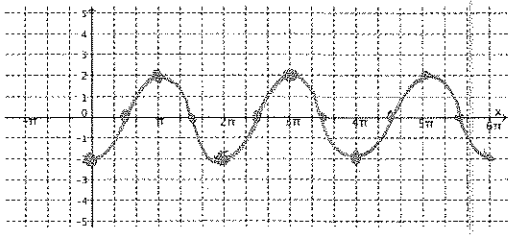


Graphing Sine and Cosine Practice – Amplitude & Period. Graph each function.

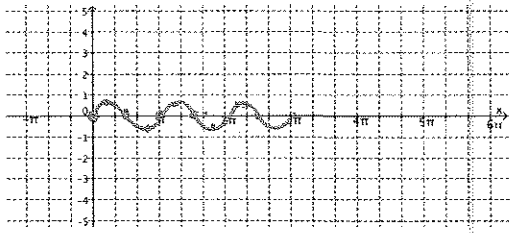
	Amplitude	b – value	period
1. $y = 3\sin x$	3	1	2π
2. $y = -2\cos x$	2	1	2π
3. $y = 0.5\sin 2x$	1/2	2	π
4. $y = 4\cos(x/2)$	4	1/2	4π



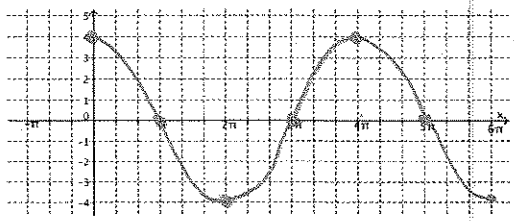
1. $y = 3\sin x$



2. $y = -2\cos x$



3. $y = 0.5\sin 2x$



4. $y = 4\cos(x/2)$

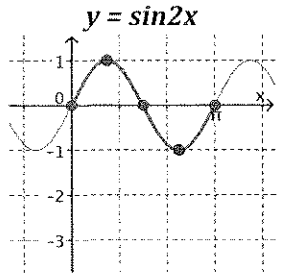
Translating Sine and Cosine Functions

For $y = a\sin bx + k$ or $y = a\cos bx + k$

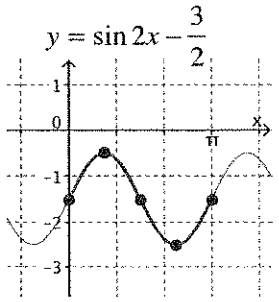
- $|a|$ is the amplitude of the function
- if a is negative the graph flips over the x-axis
- b is the number of cycles in the interval 0 to 2π
- $\frac{2\pi}{b}$ is the period of the function
- k is the vertical shift

Example: Sketch the graph of $y = \sin 2x - \frac{3}{2}$ ← moves down $\frac{3}{2}$

$|a| = 1$, so the amplitude is 1
$b = 2$ so there are 2 cycles from 0 to 2π
$\frac{2\pi}{b} = \frac{2\pi}{2} = \pi$ so the period is π
Sketch one cycle of $y = \sin 2x$
Use the 5 key points.



Since $k = -\frac{3}{2}$ translate the graph $\frac{3}{2}$ units down. Sketch the final graph.



Key

Graphing Worksheet

I. Determine the amplitude, b value, and period for each function.

1. $y = -\frac{1}{2}\cos x$
2. $y = 2\cos 6x$
3. $y = -4\sin\frac{\pi}{4}x$
4. $y = 3\sin\frac{3}{2}x$
5. $y = -5\cos\frac{5\pi}{3}x$
6. $y = \cos 2x$

Amplitude	b – value	period
$\frac{1}{2}$	1	2π
2	6	$\pi/3$
4	$\pi/4$	8
3	$3/2$	$4\pi/3$
5	$5\pi/3$	$\frac{6}{5}$
1	2	π

$2\pi \div \frac{5\pi}{3} = 2\pi \cdot \frac{3}{5\pi}$

7. $y = 3\sin x$
8. $y = 5\cos x$
9. $y = 4\cos 2x$
10. $y = -2\sin\frac{1}{2}x$
11. $y = -\cos 3x$
12. $y = 2\sin\frac{1}{3}x$

Amplitude	b-value	period
3	1	2π
5	1	2π
4	2	π
2	$1/2$	4π
1	3	$\frac{2\pi}{3}$
2	$1/3$	6π

III. Determine the amplitude, b value, period, and vertical shift for each function.

13. $y = \cos 2x - 5$
14. $y = 3\cos\frac{\pi}{2} + 4$
15. $y = -\cos 3x - 2$
16. $y = -2\sin \pi x + 1$
17. $y = 4\sin\frac{x}{4} + 2$
18. $y = 3\sin 6x - 3$

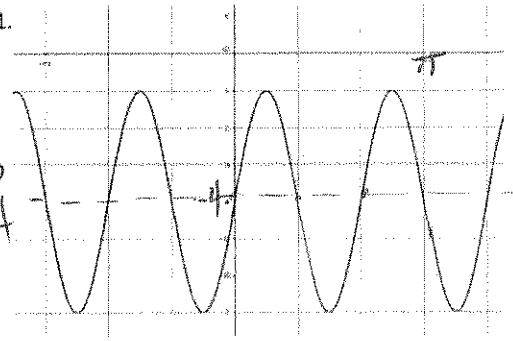
Amplitude	b-value	period	Vertical Shift
1	2	π	dn 5
3	$\pi/2$	4	up 4
1	3	$2\pi/3$	dn 2
2	π	2	up 1
4	$1/4$	8π	up 2
3	6	$\pi/3$	dn 3

Writing Equations from Graphs

Write the indicated equation for each graph.

HONORS

1.

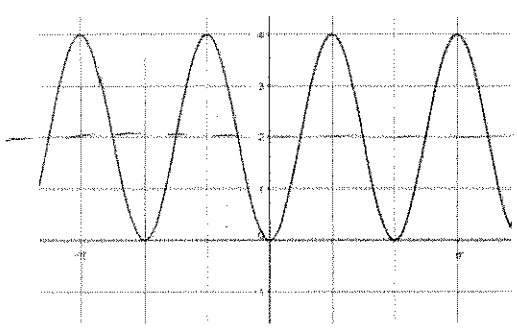


b=3
A=3
dn 4

Write a sine equation.

$y = 3\sin 3x - 4$

2.



b=3

Write a cosine equation.

$y = -2\cos 3x + 2$