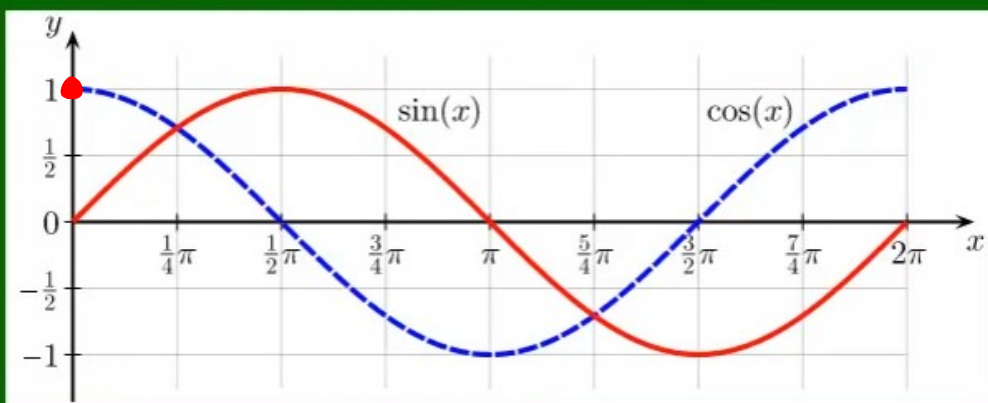
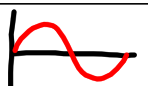
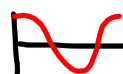


<https://www.youtube.com/watch?v=Q55T6LeTvsA>

Graphs of Sine and Cosine Functions



Key Points

Sine Graph		Int.	Max	Int.	Min	Int.
Cosine Graph		Max	Int.	Min	Int.	Max

Graphs of the Sine and Cosine Sinusoids

Students will be able to find all the key points of the graphs of specific sine and cosine functions.

What is "standard form" for trig functions?

All six trigonometric functions have graphs that can be drawn with Cartesian coordinates. We will focus on two of those functions:

- Sine $y = a \sin (bx - c) + d$
- Cosine $y = a \cos (bx - c) + d$

Where a, b, c and d are constants. $a \neq 0$ and $b \neq 0$.

What does "a" represent?

➤ $|a| = \text{Amplitude}$; The distance from the horizontal axis to a maximum or a minimum

What does "d" represent?

➤ $d = \text{Vertical Shift}$, *(relocate X-axis)* movement either up or down the y axis.

What is the period?

➤ $\frac{2\pi}{b} = \text{Period}$, the length of one full cycle.
A "normal period" of the sine and cosine function starts at $x = 0$ and ends at $x = 2\pi$

What is Frequency?

➤ $\frac{b}{2\pi} = \text{Frequency}$ *Not graphed

What causes a left-right shift?
+ -

➤ $\frac{c}{b} = \text{Phase Shift}$, (horizontal shift)
Just like the graph of an algebraic function.

Graphs of the Sine and Cosine Sinusoids

Students will be able to find all the key points of the graphs of specific sine and cosine functions.

How do we know where the graphs go when they're translated?

Sometimes the period is not normal. If $b \neq 1$ and or if $c \neq 0$, then the period will change and the start and stop points may change. To find the start and stop points use the following two equations and solve for x.

Start point: $bx + c = 0$ End point: $bx + c = 2\pi$

Example 1:

Find the amplitude $|a|$, period, vertical shift, phase shift, and the start and endpoints of the first period of the function.

a) $y = a \sin (bx + c) + d$

$a = 1$	$b = 1$	$c = \pi$	$d = 0$
Amplitude: $ a = 1$		Start: $bx + c = 0$	
Period: $\frac{2\pi}{b} = 2\pi$		$x + \pi = 0$	
Vertical: 0		$x = -\pi$	
Phase: $\frac{c}{b} = \frac{\pi}{1} = \pi$		End: $bx + c = 2\pi$	
π to the left		$x + \pi = 2\pi$	
		$x = \pi$	

Graphs of the Sine and Cosine Sinusoids

Students will be able to find all the key points of the graphs of specific sine and cosine functions.

Find the amplitude $|a|$, period, vertical shift, phase shift, and the start and endpoints of the first period of the function.

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

b) $y = 2 \sin (2x + 4\pi) - 6$

$a = 2$ $b = 2$ $c = 4\pi$ $d = -6$

Amplitude: 2

Start: $bx + c = 0$
 $2x + 4\pi = 0$
 $2x = -4\pi$
 $x = -2\pi$

Period: $\frac{2\pi}{2} = \pi$

Vertical: -6

End: $bx + c = 2\pi$
 $2x + 4\pi = 2\pi$
 $2x = -2\pi$
 $x = -\pi$

$\frac{c}{b}$ Phase: $\frac{4\pi}{2} = 2\pi$ left

c) $h(x) = -\frac{1}{2} \sin (x + \frac{\pi}{2}) + 1$

$$|-\frac{1}{2}|$$

$a = -\frac{1}{2}$ $b = 1$ $c = \frac{\pi}{2}$ $d = 1$

Amp: $\frac{1}{2}$

Start: $x + \frac{\pi}{2} = 0$
 $x = -\pi/2$

$\frac{2\pi}{b}$ Period: 2π

Vertical: up 1

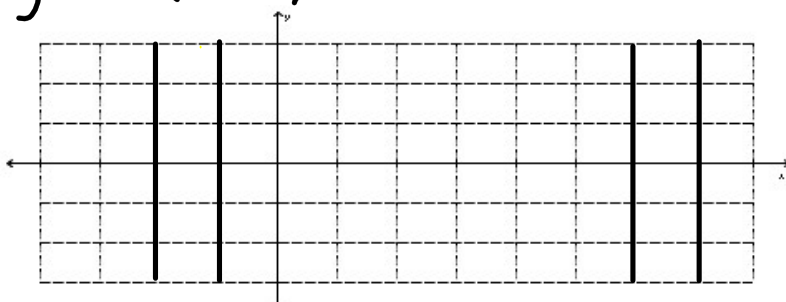
End: $x + \frac{\pi}{2} = 2\pi$
 $-\pi/2$ $-\pi/2$
 $x = \frac{3\pi}{2}$

$\frac{c}{b}$ Phase: $\frac{\pi}{2}$ left

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

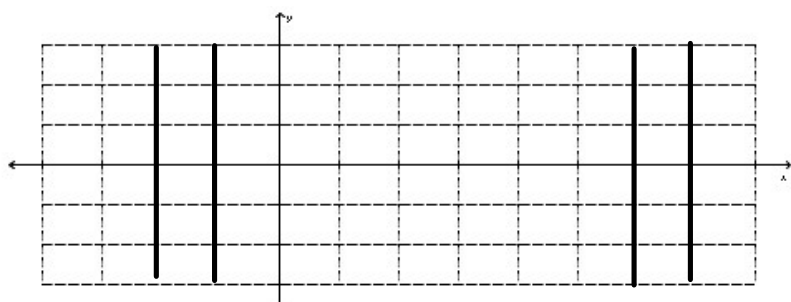
$$\frac{4\pi}{2} - \frac{\pi}{2}$$

a) $y = \sin(x + \pi)$



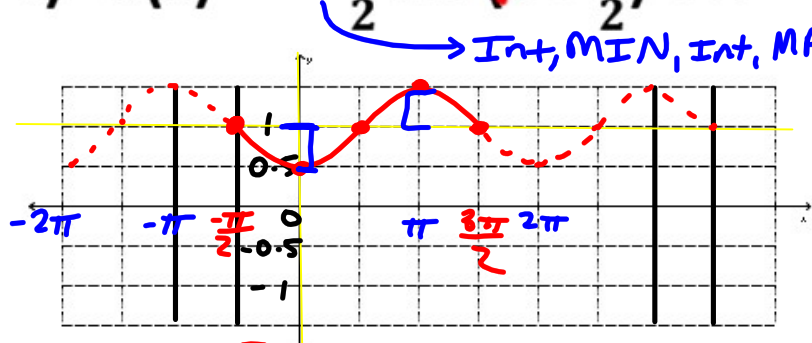
$|a| =$
 Period=
 Frequency=
 Vertical Shift:
 Phase shift:

b) $y = 2 \sin(2x + 4\pi) - 6$



$|a| =$
 Period=
 Frequency=
 Vertical Shift:
 Phase shift:

c) $h(x) = \frac{1}{2} \sin(x + \frac{\pi}{2}) + 1$



Start: $-\frac{\pi}{2}$ End: $\frac{3\pi}{2}$

$|a| = \frac{1}{2}$
 Period = 2π → 4 boxes X-axis
 Frequency = $\frac{1}{2\pi}$
 Vertical Shift: UP 1
 Phase shift: $\frac{\pi}{2}$ left

