

Warm Up

Sketch the equation:

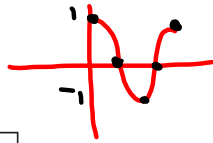
$$\frac{y+5}{3} = \cos(2\theta + 90^\circ) + 6$$

$$y+5 = 3\cos(2\theta + 90^\circ) + 18$$

$$y = 3\cos[2(\theta + 45^\circ)] + 13$$

Mapping:

$$(x, y) \rightarrow \left(\frac{1}{2}x - 45^\circ, 3y + 13\right)$$

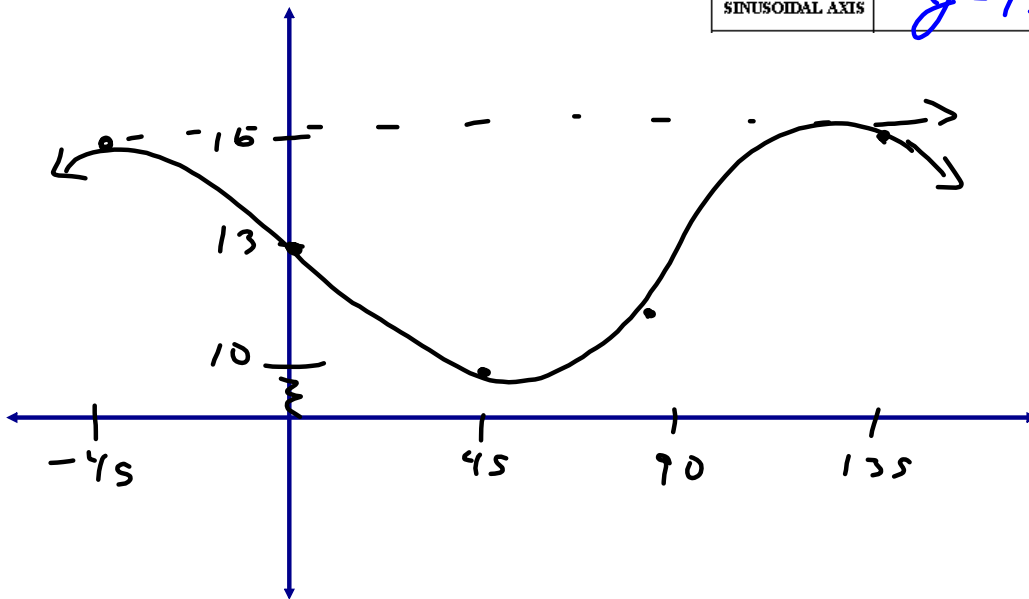


θ	y
0	1
90	0
180	-1
270	0
360	1

New points after mapping

θ	y
-45	16
0	13
45	10
90	13
135	16

DOMAIN	$\theta \in \mathbb{R}$
RANGE	$10 \leq y \leq 16$
AMPLITUDE	3
PERIOD	180°
PHASE SHIFT	45° left
VERTICAL TRANSLATION	Up 13
EQUATION OF SINUSOIDAL AXIS	$y = 13$

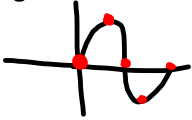


Warm-Up.. $(-3) \cdot \frac{2}{3}(y+1) = 2 \sin\left(4x + \frac{\pi}{3}\right) - 4(-3)$, ~~$-\pi \leq x \leq \pi$~~

$$\frac{2}{2}(y+1) = -\frac{6}{2} \sin\left[4\left(x + \frac{\pi}{12}\right)\right] + \frac{12}{2}$$

$$y+1 = -3 \sin\left[4\left(x + \frac{\pi}{12}\right)\right] + 6^{-1}$$

$$y = -3 \sin\left[4\left(x + \frac{\pi}{12}\right)\right] + 5$$



DOMAIN	$0 \in \mathbb{R}$
RANGE	$2 \leq y \leq 8$
AMPLITUDE	3
PERIOD	$\frac{\pi}{2}$
PHASE SHIFT	$\frac{\pi}{12}$ left
VERTICAL TRANSLATION	Up 5
EQUATION OF SINUSOIDAL AXIS	$y = 5$

Mapping:

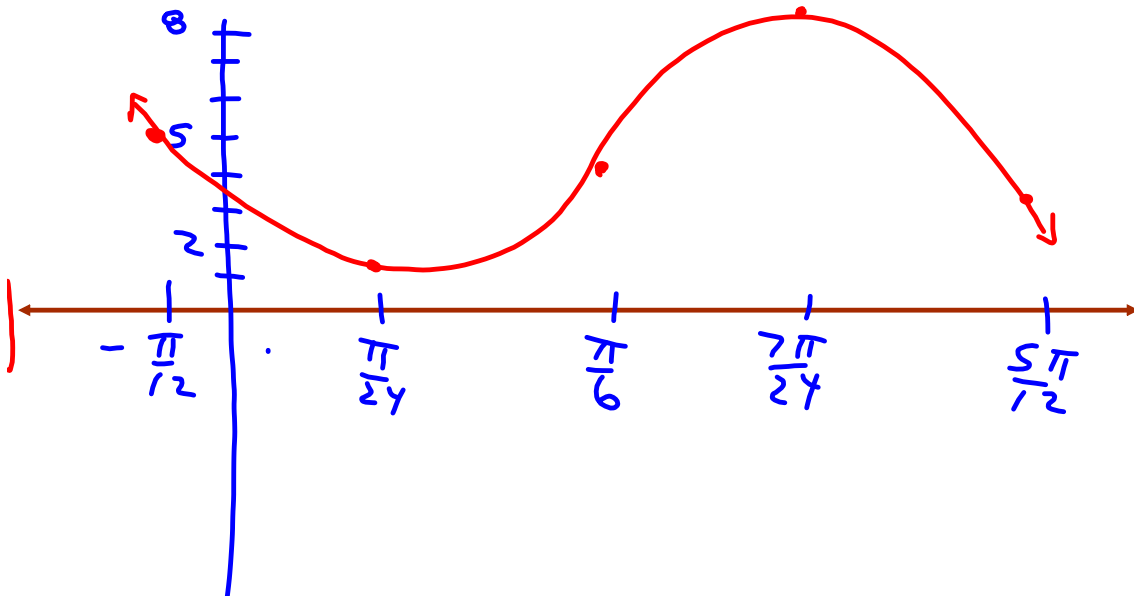
$$(x, y) \rightarrow \left(\frac{1}{4}x - \frac{\pi}{12}, -3y + 5\right)$$

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

$-\frac{2\pi}{24}$
 $+\frac{3\pi}{24}$
 $\frac{\pi}{24}$
 $\frac{\pi}{24}$
 $\frac{\pi}{24}$
 $\frac{\pi}{24}$

x	y
$\frac{\pi}{24}$	5
$\frac{\pi}{12}$	2
$\frac{\pi}{8}$	5
$\frac{\pi}{6}$	8
$\frac{\pi}{4}$	5

$$\frac{\pi}{8} - \frac{\pi}{12} = \frac{3\pi}{24} - \frac{2\pi}{24} = \frac{\pi}{24}$$



Textbook Practice Problems...

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#1, 2, 3, 4, 5, 6, 7, 10

Developing Trigonometric Functions from Properties...

Develop a trigonometric function that fits the following description...

- Models a sine function
- Period is 120°
- Graph is reflected in x-axis
- Wave has a range of $-8 \leq y \leq 2$
- Graph has a phase shift of 60° right
- Graph has a vertical translation of 3 units down

$$Amp = \frac{2 - (-8)}{2} = 5$$

$$Per = \frac{360}{k} *$$

$$y = a \sin[k(\theta + c)] + d$$

↑ ↑ ↑ ↑

$$y = 5 \sin[3(\theta - 60^\circ)] - 3$$

$120 = \frac{360}{k}$
 $120k = 360$
 $k = \frac{360}{120} = 3$

...Now we must learn how to identify all of the above information from a graph.

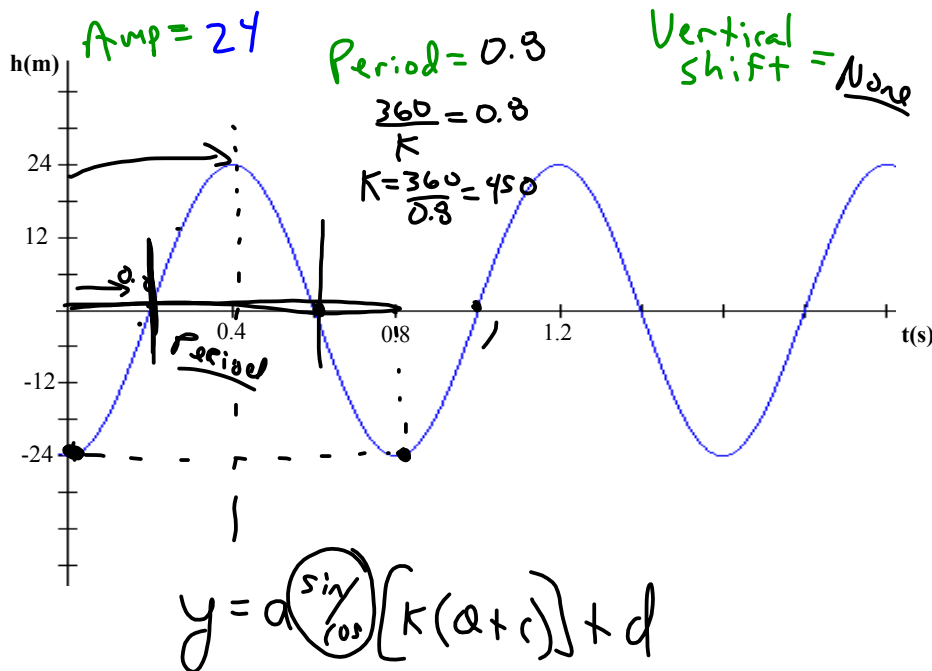
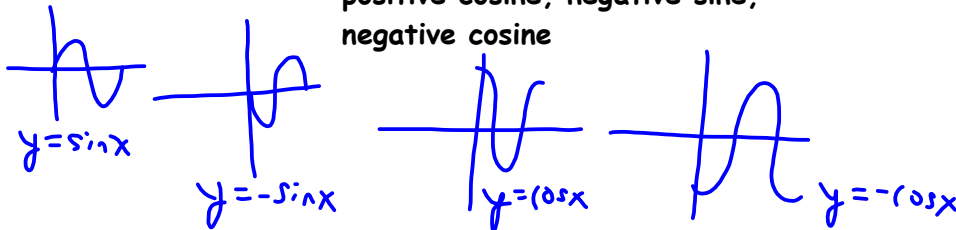
Developing the Equation of a Sinusoidal Function

STEPS: 1) Identify & label the **sinusoidal axis**.

2) Determine the **amplitude, period & vertical translation**.

3) Pick a **trig function & determine the corresponding phase shift**.

- the choices are: positive sine,
positive cosine, negative sine,
negative cosine



$$y = -24 \cos[450(t)]$$

$$y = -24 \cos(450t)$$

$$y = 24 \cos[450(t-0.4)]$$

$$y = 24 \sin[450(t-0.2)]$$

$$y = -24 \sin[450(t-0.6)]$$