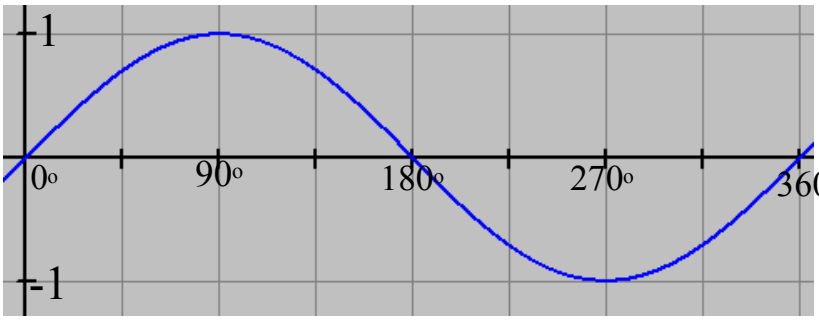
Basic Trig Graphs

y = sin θ



Period = 360°
Amplitude = 1
Eq'n of Sinusoidal Axis: y = 0
Domain: {θ ∈ R}
Range: { -1 ≤ y ≤ 1 } [-1,1]

θ	y
0°	0
90°	1
180°	0
270°	−1
360°	0

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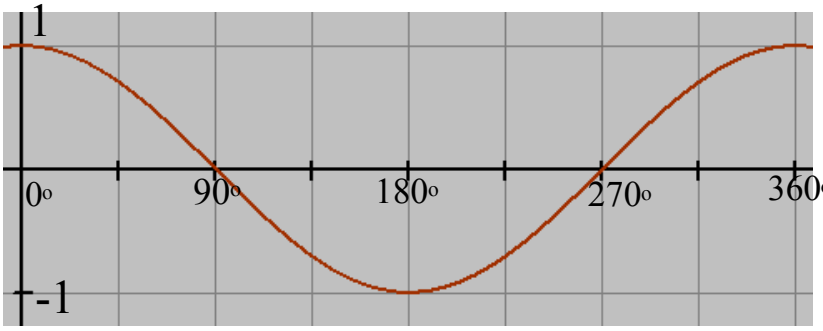
y = cos θ



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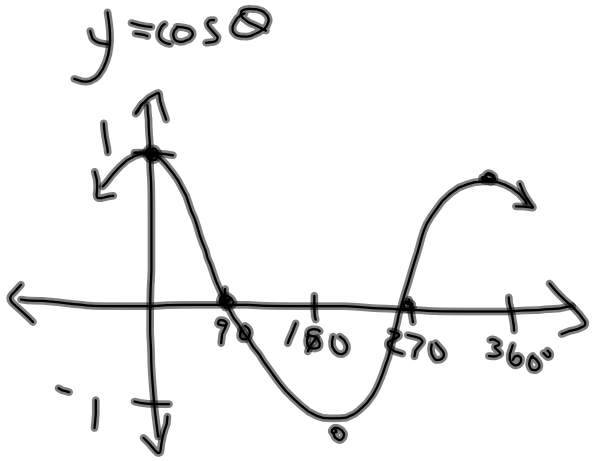
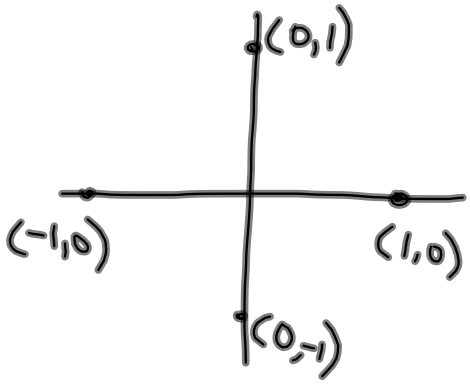
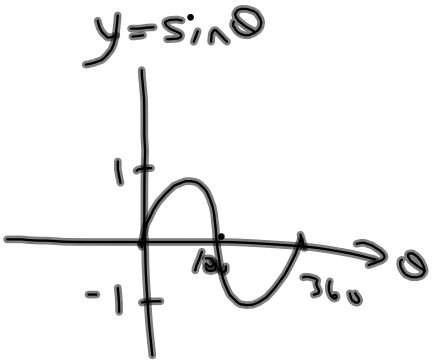
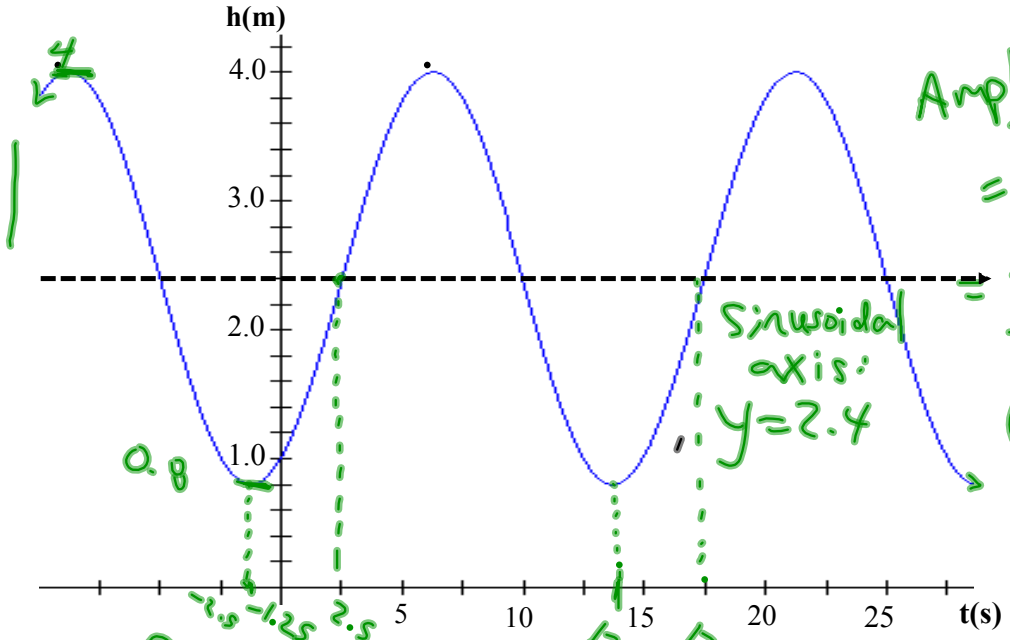
270°	0
360°	1


y = cos θ
1
-1
90
180
270
360°
0


(0,1)
(-1,0)
(1,0)
(0,-1)


y = sin θ
1
-1
θ
360



Amplitude?

$= 1.6$

$= \frac{4 - 0.8}{2}$

$= 1.6$

Sinusoidal axis: $y = 2.4$

Period $= 17.5 - 2.5$

$= 15$

Range: $0.8 \leq y \leq 4$.

Domain: $t \in \mathbb{R}$

Transformations of the Sinusoidal Function

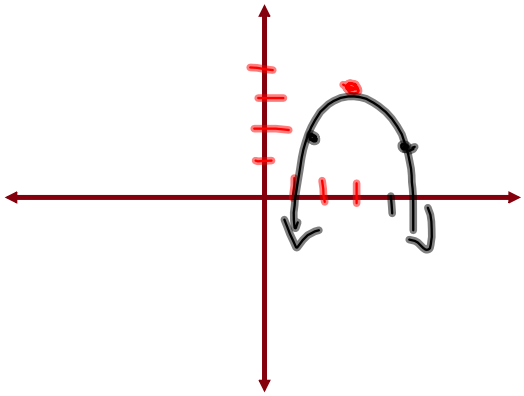
Recall...

$$y = -2(x-3)^2 + 4$$

- reflection in the x-axis
- vertical stretch factor
- horizontal translation
- vertical translation

Vertex $\Rightarrow$ V(3, 4)

Sketch $\Rightarrow$



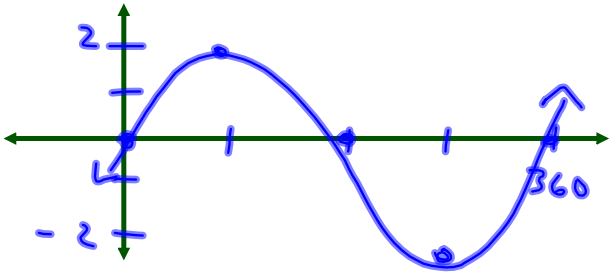
Now, let's look at a sinusoidal function...

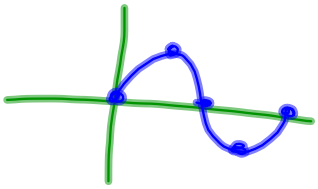
$$y = -2\sin[3(\theta - 60°)] - 1$$

- Reflection
- Amplitude (v. stretch)
- Horizontal Stretch
- Phase Shift (h. translation)
- Vertical Translation

EXAMPLES: Sketch each of the following...

a) $y = 2\sin\theta$

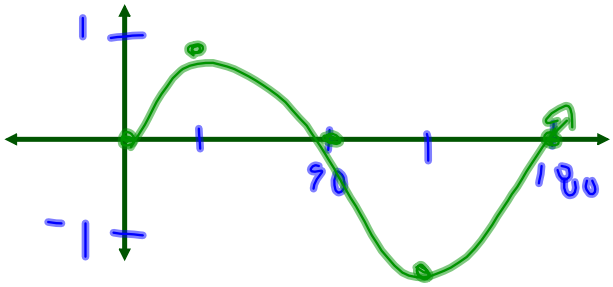


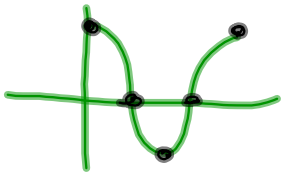


b) $y = \sin 2\theta$

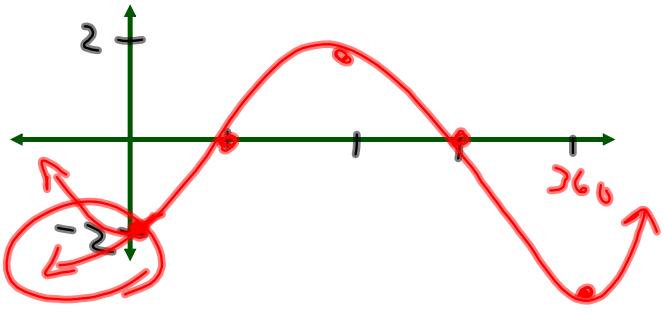
Normal Period = 360°

H. Stretch Factor = $\frac{1}{2}$





c) $y = -2\cos\theta$



Sketching Sinusoidal Functions using Transformations

Development of a standard form for sinusoidal functions...

Standard Form $\longrightarrow f(\theta) = a\sin[k(\theta - c)] + d$

$\sin(2\theta - \pi)$

$\sin(2(\theta - \frac{\pi}{2}))$

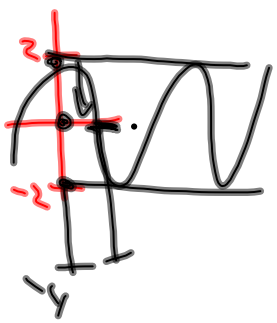
1. Reflection: If a < 0 the graph will be reflected in the x-axis.
2. Amplitude: The amplitude of the graph will be equal to | a | .
3. Period: The period of the graph will be equal to $\frac{360°}{k}$
4. Horizontal Phase Shift: The graph will shift "c" units to the right. (Think Opposite)
5. Vertical Translation: The graph will shift "d" units up.

Mapping Notation: $(x, y) \rightarrow \left(\frac{1}{k}\theta + c, ay + d\right)$

Transformations of Sinusoidal Functions

Example: $f(\theta) = -2\sin 3(\theta + 30°) - 2$

Domain	$\theta \in R$
Range	$-4 \leq y \leq 0$
Reflection	yes, in x-axis
Amplitude	2
Horizontal Phase Shift	30° Left
Vertical Translation	2 down
Period	120°



$k = 3$

$Per = \frac{360°}{k}$

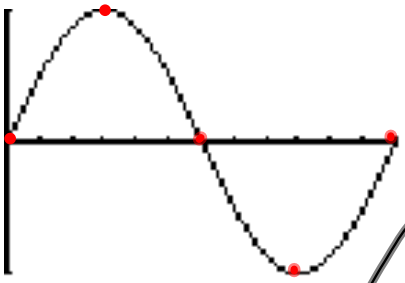
$= \frac{360°}{3}$

$= 120°$

This time we will graph the same function using a mapping:

$$f(\theta) = -2\sin 3(\theta + 30°) - 2$$

$y = \sin\theta$



Mapping:

$(x, y) \rightarrow \left(\frac{1}{3}(0) - 30,\ -2y - 2\right)$

θ	y
0	0
90	1
180	0
270	-1
360	0

New points after mapping

θ	y
-30	-2
0	-4
30	-2
60	0
90	-2