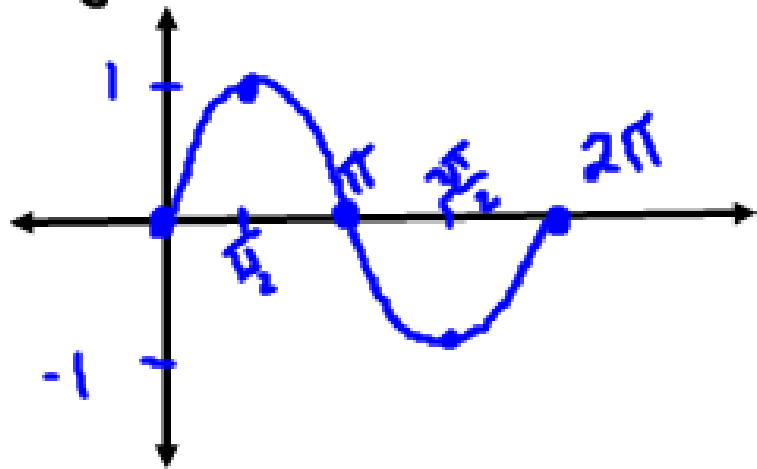# Transformations of Sinusoidal Functions

Focus on...

- graphing and transforming sinusoidal functions
- identifying the domain, range, phase shift, period, amplitude, and vertical displacement of sinusoidal functions
- developing equations of sinusoidal functions, expressed in radian and degree measure, from graphs and descriptions
- solving problems graphically that can be modelled using sinusoidal functions
- recognizing that more than one equation can be used to represent the graph of a sinusoidal function
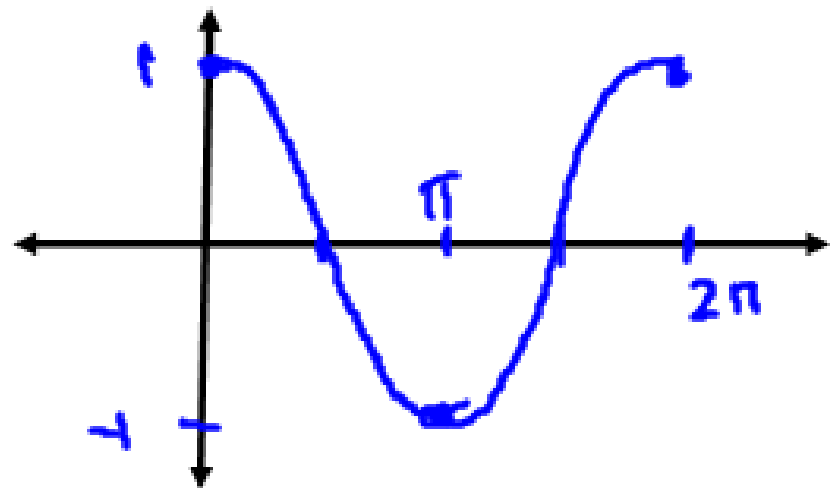
$$y = a\sin(b(x-c)) + d$$

$$y = a \cdot \cos(b(x-c)) + d$$

Transformation	Part of graph that is affected
Vertical Stretch: a	Amplitude
Vertical Translation: d	SA
Horizontal Stretch: $1/b$	Period
Horizontal Translation: c	Starting Pt.
Reflection: $a < 0$ x-axis	Switch local max, min

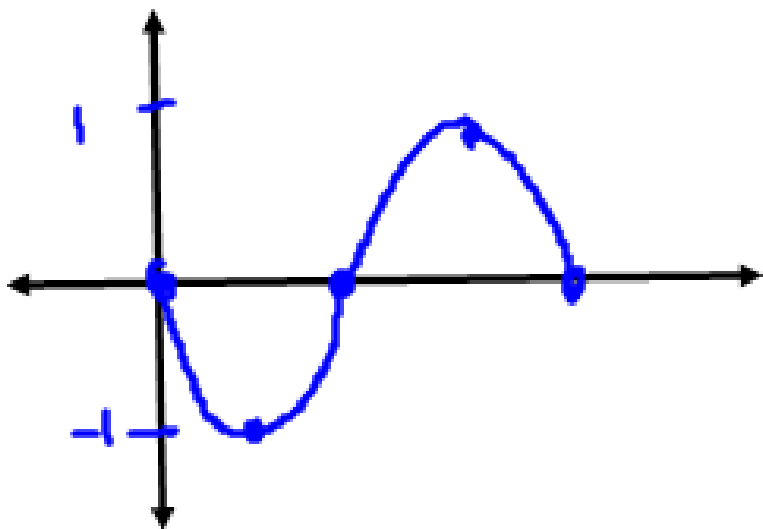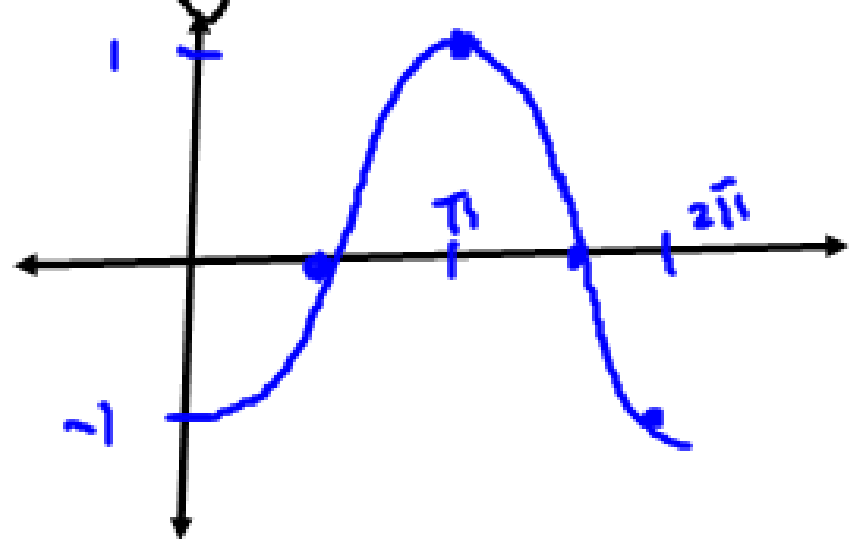# $y = \sin x$

$y = \cos x$

$y = -\sin x \ (R_x)$

$y = -\cos x \ (R_x)$

$$y = a \sin[b(x - c)] + d$$

Or

$$y = a \cos[b(x - c)] + d$$

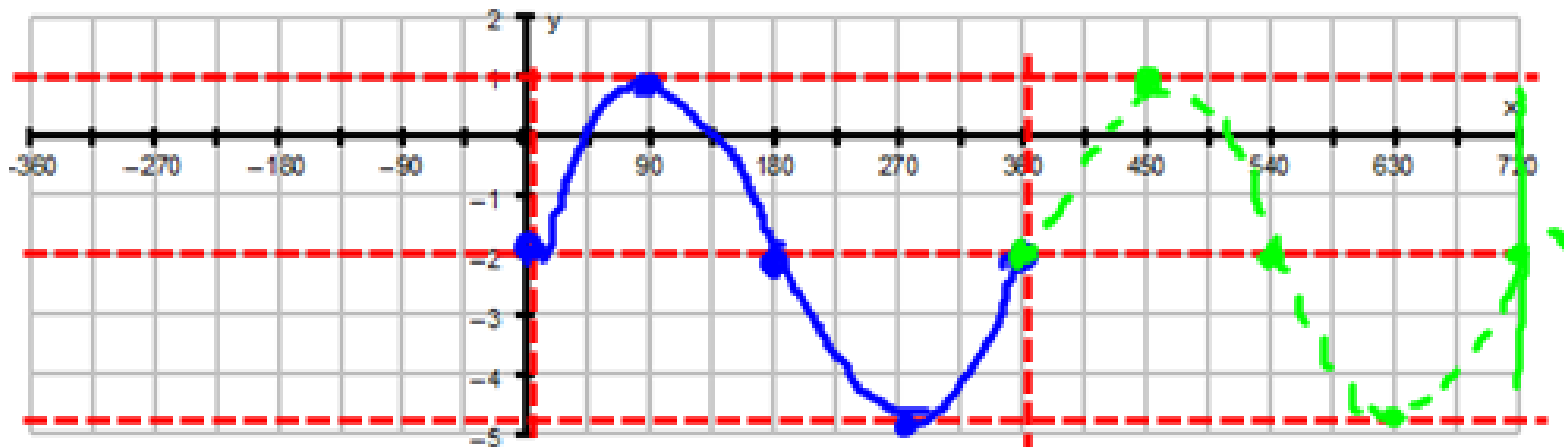| Amplitude	Vertical Stretch a
Sinusoidal Axis	Vertical Translation d
Period	Horizontal Stretch x 360 $\text{Period} = \dfrac{1}{b} \times 360° \ \text{ or } \ \text{Period} = \dfrac{1}{b} \times 2\pi$ $\text{or } HS = \dfrac{Period}{360°} \ \text{ or } \ HS = \dfrac{Period}{2\pi}$
Starting Point (phase shift)	Horizontal Translation c
Reflection	"-" in front of a

Examples – Graph each of the following.

$y = 3\sin(x) - 2$

(a) $\frac{1}{3}(y+2) = \sin(x)$ (in degrees)
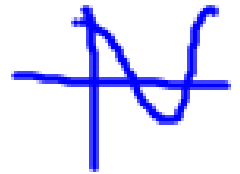
Transformations:

VS 3
YT -2
Rx NO
HS 1
HT 0

S.A.: $y = -2$
Amp.: 3
Period: $360°$
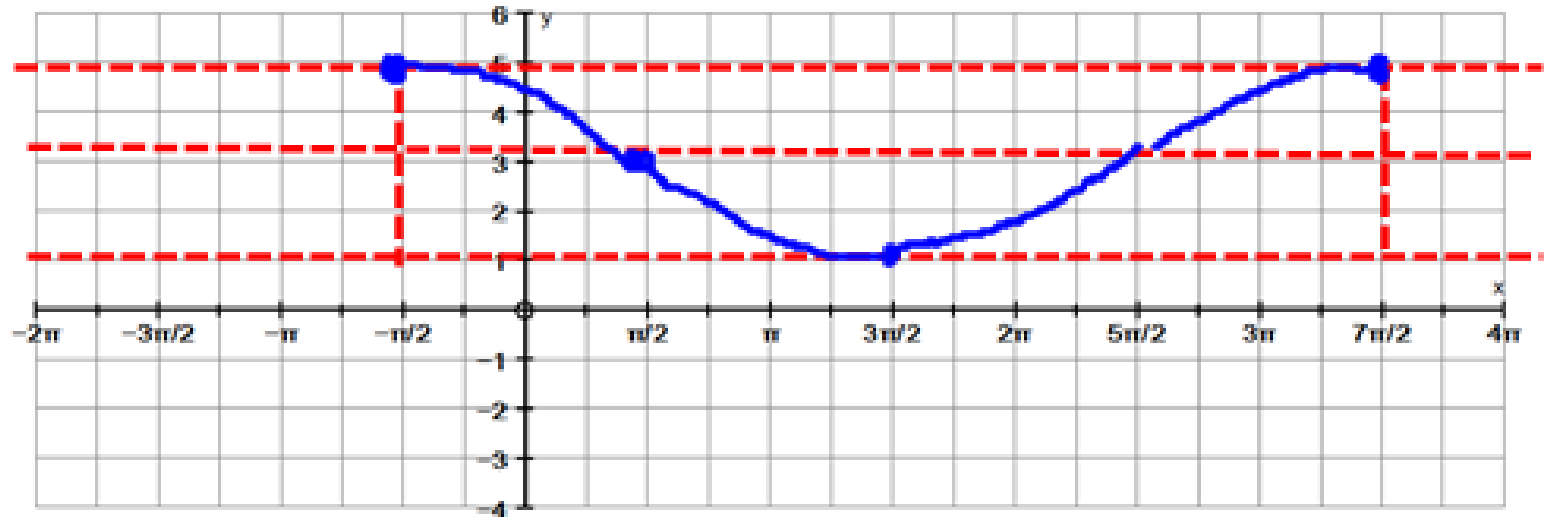Starting Point: $x = 0°$

(b) $y = 2\cos\left[\frac{1}{2}\left(x + \frac{\pi}{2}\right)\right] + 3$ (in radians)

Transformations:

VS 2
VT 3
R_x NO
HS 2
HT $-\frac{\pi}{2}$

$P = 2 \times 2\pi = 4\pi$

S.A.: $y = 3$
Amp.: 2
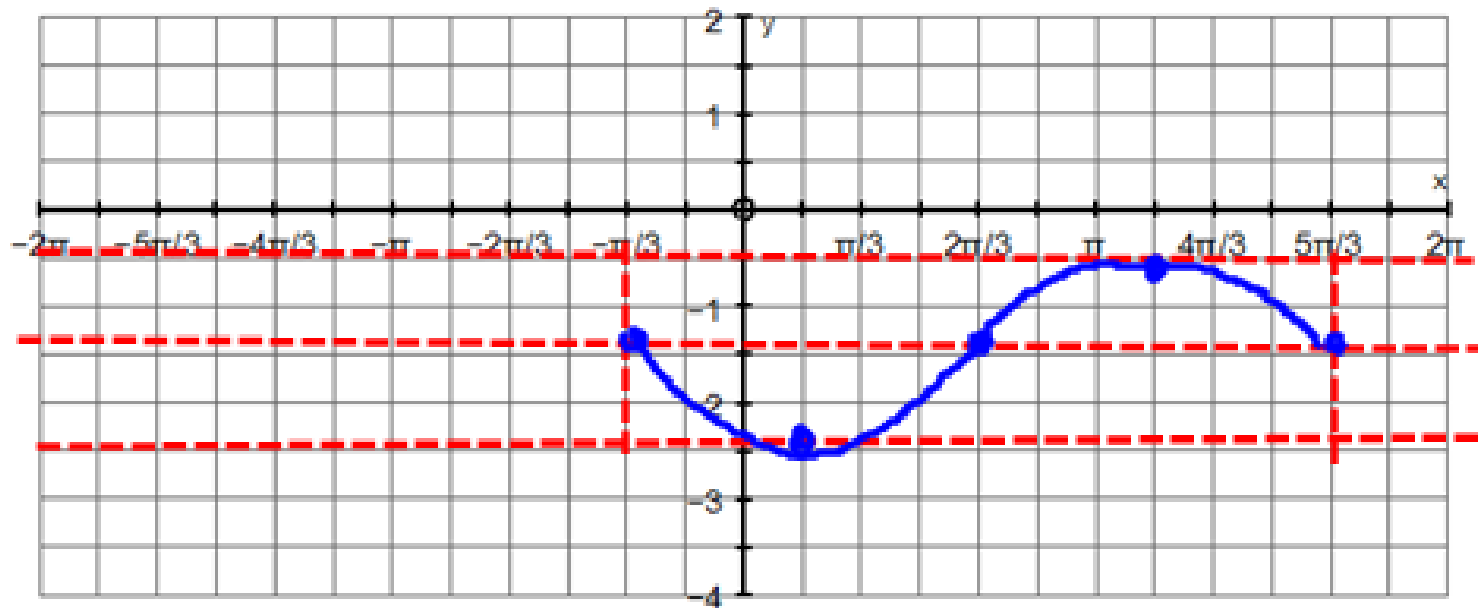Period: 4π
Starting Point: $x = \frac{-\pi}{2}$

(c) $y = -\sin\left(x + \dfrac{\pi}{3}\right) - 1\dfrac{1}{2}$ (in radians)

VS1
VT ~1.5
R_y Yes :)

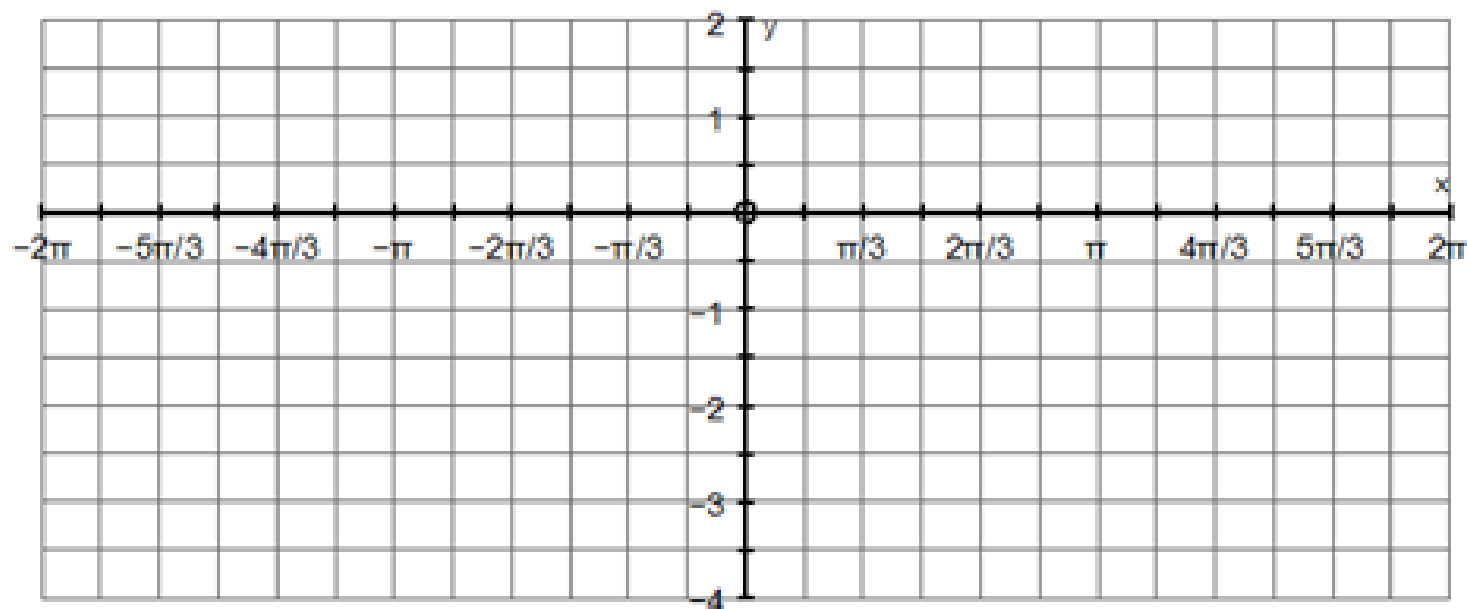HS 1
HT $-\dfrac{\pi}{3}$

S.A.: $y = -1.5$

Amp.: 1

Period: 2π

Starting Point: $x = -\dfrac{\pi}{3}$

HW pg 236 (5.1) #19, 20, 22
pg 252 (5.2) # 1, 3, 13,

(c) $y = -\sin\left(x + \dfrac{\pi}{3}\right) - 1\dfrac{1}{2}$ (in radians)

VS 1
VT −1.5
R$_y$ Yes :)
HS 1
HT −$\dfrac{\pi}{3}$

HW pg 236 (5.1) #19,20,22
pg 252 (5.2) # 1,3,13,