

# Writing Equations of

## Sine & Cosine Graphs

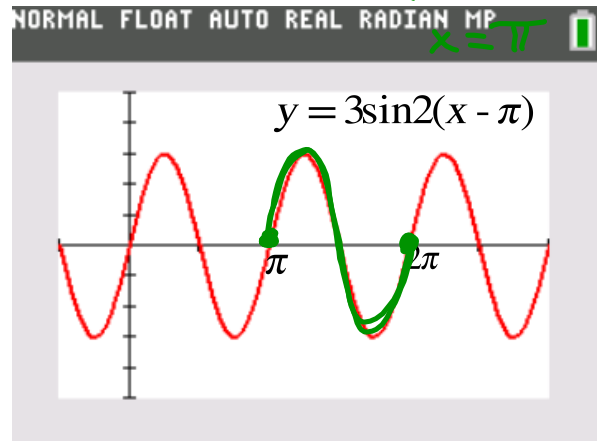
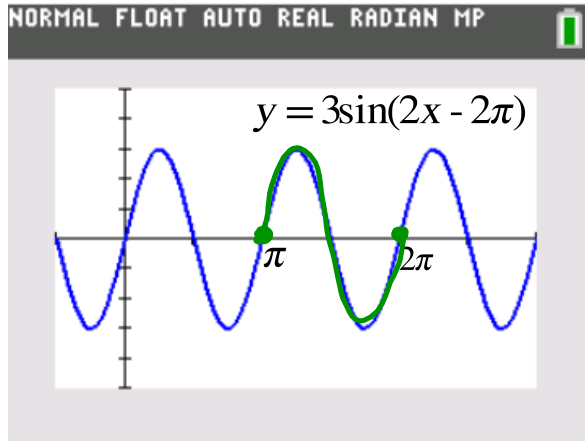
$$\begin{aligned} 2x - 2\pi &= 0 \\ 2x &= 2\pi \\ x &= \pi \end{aligned}$$

phase shift

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

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

$$\begin{aligned} x - \pi &= 0 \\ x &= \pi \end{aligned}$$



## Writing Equations of Sine and Cosine Graphs

Determine:

- sine or cosine
- amplitude
- vertical shift
- period
- phase shift

Use:

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

or

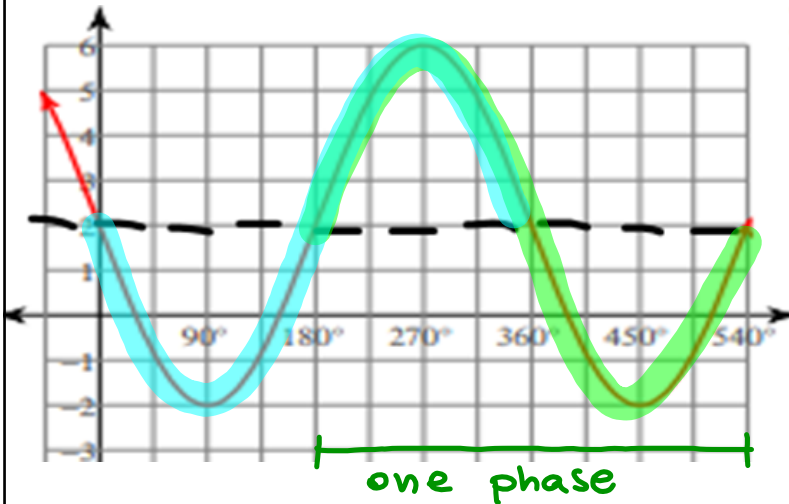
$$y = a \cdot \cos(bx - c) + d$$

$$\text{period: } \frac{2\pi}{b} \rightarrow b = \frac{2\pi}{\text{period}} \text{ or } \frac{360^\circ}{\text{period}}$$

$$\begin{aligned} \text{argument: } & b(x - \text{phaseshift}) \\ & (bx - c) \end{aligned}$$

$$b(\theta - \text{phaseshift})$$

Write the equation of a **sine** function.



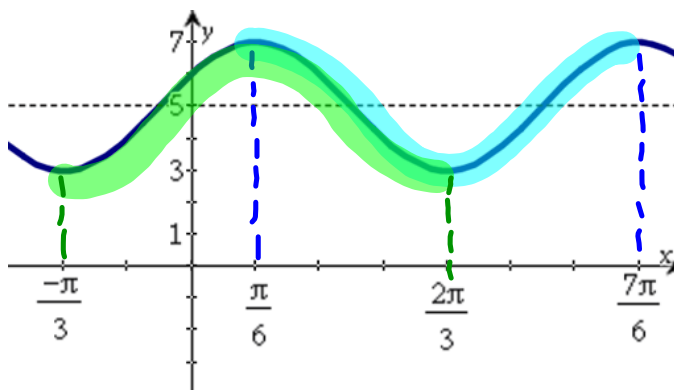
Amplitude: 4  
 Reflect across x-axis? h.a. no/yes  
 Phase Shift: 180° / 0°  
 Domain: [180°, 540°] / [0°, 360°]  
 Period: 360°  
 Vertical Shift: 2  
 Range: [-2, 6]

$$y = -4 \sin \theta + 2$$

$$y = 4 \sin \frac{1}{b} (\theta - 180^\circ) + 2$$

↑  
 $b = \frac{360^\circ}{360^\circ}$

Write the equation of a **cosine** function.



Amplitude: 2  
 Reflect across x-axis? no/yes  
 Phase Shift: π/6 / -π/3  
 Domain: [π/6, 7π/6] / [-π/3, 2π/3]  
 Period: π  
 Vertical Shift: 5  
 Range: [3, 7]

$$y = -2 \cos 2(x + \frac{\pi}{3}) + 5 \quad y = 2 \cos 2(x - \frac{\pi}{6}) + 5$$

↑  
 $\frac{2\pi}{\pi}$