

Steps for graphing Sine and Cosine Functions:

Step 1: Make sure the equation is written as $y = a\sin(b\theta - c) + d$ or $y = a\sin b\left(\theta - \frac{c}{b}\right) + d$.

Step 2: Identify the following:

- a) Amplitude
- b) Period
- c) Phase Shift
- d) Vertical Shift

Step 3: Draw your resting line of $y = d$

Step 4: Determine your initial endpoint of the first period $\left(-\frac{c}{b}\right)$

- a) Positive Sine starts at a Resting position and goes to a Maximum
- b) Negative Sine starts at a Resting position and goes to a Minimum
- c) Positive Cosine starts at a Maximum
- d) Negative Cosine starts at a Minimum

Step 5: Determine your last endpoint of the first period $\left(-\frac{c}{b} + \frac{2\pi}{b}\right)$.

Step 6: Determine your middle point of the first period (half the distance horizontally between your two endpoints).

Step 7: Determine your other two critical points (half the distance horizontally between the middle point and each end point)

Step 8: Connect your points using a SMOOTH curve.

Example 1: $y - 3 = -4 \cos\left(\frac{\theta}{2} + \frac{\pi}{4}\right)$

Step 1: Make sure the equation is written as $y = a \sin(b\theta - c) + d$ or $y = a \sin b\left(\theta - \frac{c}{b}\right) + d$.

$$y = -4 \cos\left(\frac{\theta}{2} + \frac{\pi}{4}\right) + 3$$

Step 2: Identify the following:

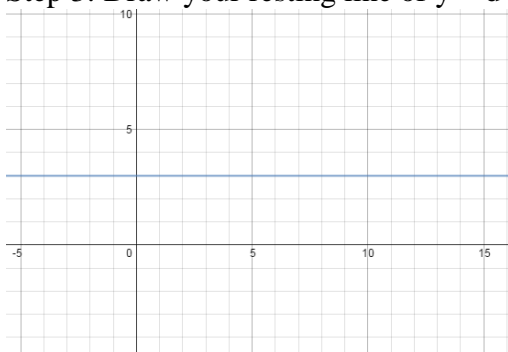
e) Amplitude: $a = -4$, amplitude = 4

f) Period: $b = \frac{1}{2}$, period = $\frac{2\pi}{\frac{1}{2}} = 4\pi$

g) Phase Shift: $c = \frac{\pi}{4}$, $b = \frac{1}{2}$, phase shift = $-\left(\frac{\frac{\pi}{4}}{\frac{1}{2}}\right) = -\frac{\pi}{2}$

h) Vertical Shift: $d = 3$, vertical shift = 3

Step 3: Draw your resting line of $y = d$



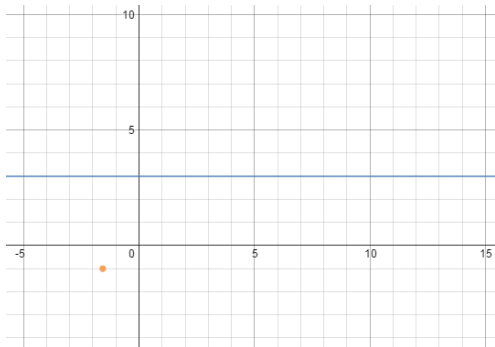
Step 4: Determine your initial endpoint of the first period $\left(-\frac{c}{b}\right) = -\frac{\pi}{2} = \theta$

e) Positive Sine starts at a Resting position and goes to a Maximum

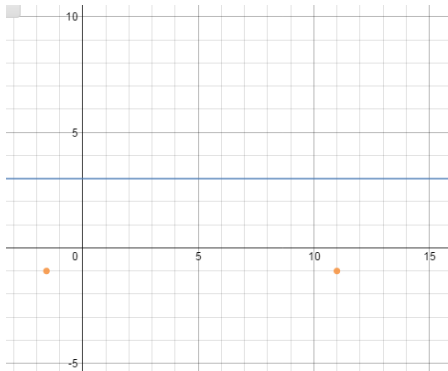
f) Negative Sine starts at a Resting position and goes to a Minimum

g) Positive Cosine starts at a Maximum

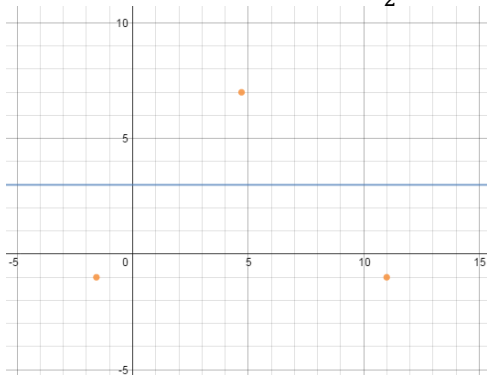
h) Negative Cosine starts at a Minimum



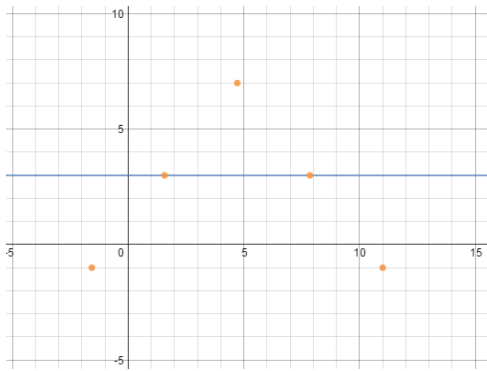
Step 5: Determine your last endpoint of the first period $\left(-\frac{c}{b} + \frac{2\pi}{b}\right) = -\frac{\pi}{2} + 4\pi = \frac{7\pi}{2} = \theta$.



Step 6: Determine your middle point of the first period (half the distance horizontally between your two endpoints). $\frac{3\pi}{2} = \theta$



Step 7: Determine your other two critical points (half the distance horizontally between the middle point and each end point). $\frac{\pi}{2}$ and $\frac{5\pi}{2} = \theta$



Step 8: Connect your points using a SMOOTH curve.

