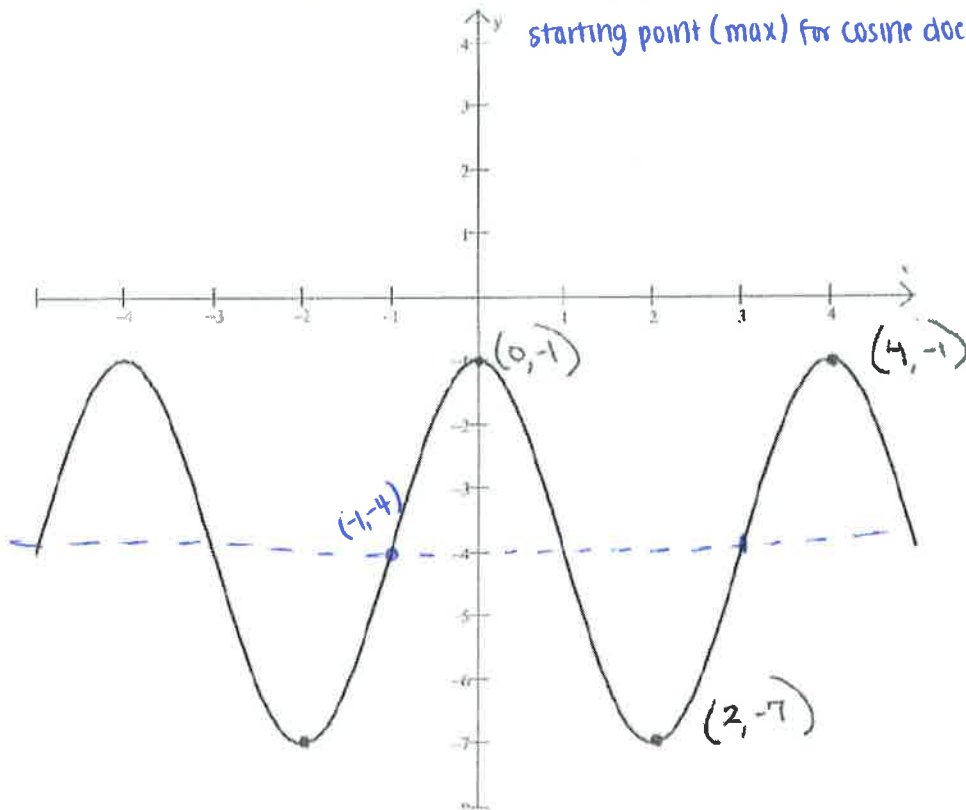


What if the midline is not on the y-axis? How do you determine where the starting points are?

↳ draw in the midline and determine a starting point for the sine curve from midline

starting point (max) for cosine doesn't change



$$\text{amp} = \frac{1}{2}(-1 - (-7)) = \frac{1}{2}(-1 + 7) = \frac{1}{2}(6) = 3$$

Same value <

midline: $y = -4$

d-value: -4

Period: from -1 to 3

difference = $3 - (-1) = 3 + 1 = 4 \Rightarrow \text{Period} = 4$

b-value: Period = $\frac{2\pi}{b}$

$$\downarrow$$

$$\frac{4}{1} = \frac{2\pi}{b} \Rightarrow \frac{4b}{4} = \frac{2\pi}{4} \Rightarrow b = \frac{\pi}{2}$$

Phase shift (sine): starting point at $-1 \Rightarrow \text{P.S.} = -1$

$$\frac{-1}{1} = \frac{c}{\pi/2} \Rightarrow c = \frac{-\pi}{2}$$

Phase shift (cosine): starting point at $4 \Rightarrow \text{PS} = 4$

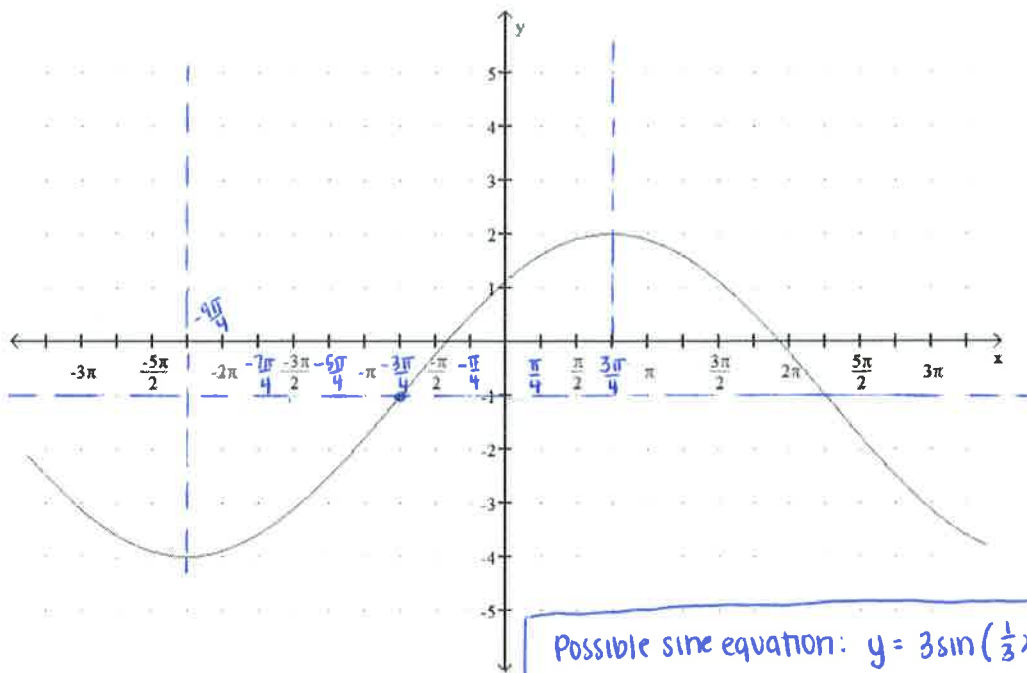
$$\frac{4}{1} = \frac{c}{\pi/2} \Rightarrow c = 4\left(\frac{\pi}{2}\right) = \frac{4\pi}{2} = 2\pi$$

Possible Cosine Equation: $y = 3 \cos\left(\frac{\pi}{2}x - 2\pi\right) - 4$

Possible Sine Equation: $y = 3 \sin\left(\frac{\pi}{2}x - \frac{\pi}{2}\right) - 4$

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

What if you can't tell what the full period is from the graph? How do you find the period?



Possible sine equation: $y = 3\sin\left(\frac{1}{3}x + \frac{\pi}{4}\right) - 1$
 Possible cosine equation: $y = 3\cos\left(\frac{1}{3}x - \frac{\pi}{4}\right) - 1$

$$a = \frac{1}{2}(2 - (-4)) = \frac{1}{2}(2 + 4) = \frac{1}{2}(6) = 3$$

midline: $y = -1$

d-value: -1

Period: Find a portion of the graph from a max \rightarrow a min (or vice versa) and double it

$$-\frac{9\pi}{4} \text{ to } \frac{3\pi}{4} \Rightarrow \text{difference: } \frac{3\pi}{4} - (-\frac{9\pi}{4}) = \frac{3\pi}{4} + \frac{9\pi}{4} = \frac{12\pi}{4} = 3\pi \leftarrow \text{half of a period}$$

$$\times 2$$

$$6\pi \leftarrow \text{whole period}$$

b-value: Period = $\frac{2\pi}{b}$

$$\frac{6\pi}{1} = \frac{2\pi}{b} \Rightarrow \frac{6\pi b}{6\pi} = \frac{2\pi}{6\pi} \Rightarrow b = \frac{2}{6} \Rightarrow b = \frac{1}{3}$$

Phase shift (sine): Find starting point on midline

$$PS = -\frac{3\pi}{4}$$

$$-\frac{3\pi}{4} = \frac{c}{\frac{1}{3}} \Rightarrow 4c = \left(\frac{1}{3}\right) - 3\pi$$

$$4c = -\pi$$

$$c = -\frac{\pi}{4}$$

Phase shift (cosine): Starting point at a max

$$PS = \frac{3\pi}{4}$$

$$\frac{3\pi}{4} = \frac{c}{\frac{1}{3}} \Rightarrow 4c = \left(\frac{1}{3}\right) 3\pi$$

$$4c = \pi$$

$$c = \frac{\pi}{4}$$