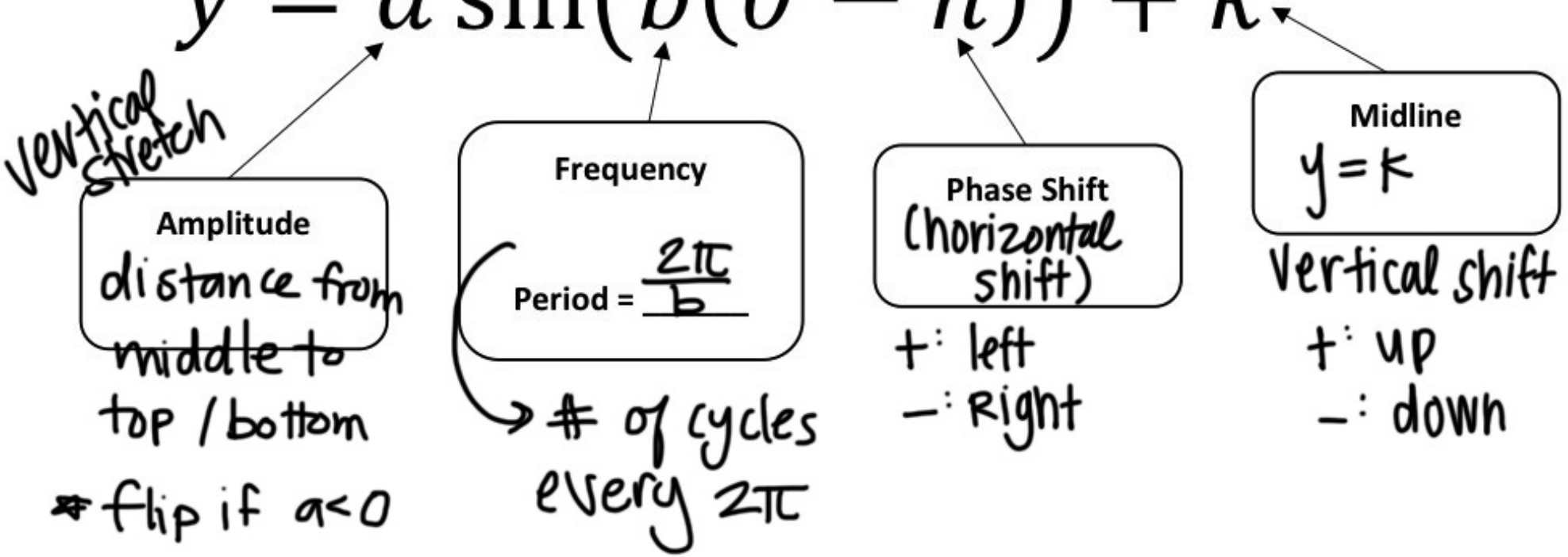
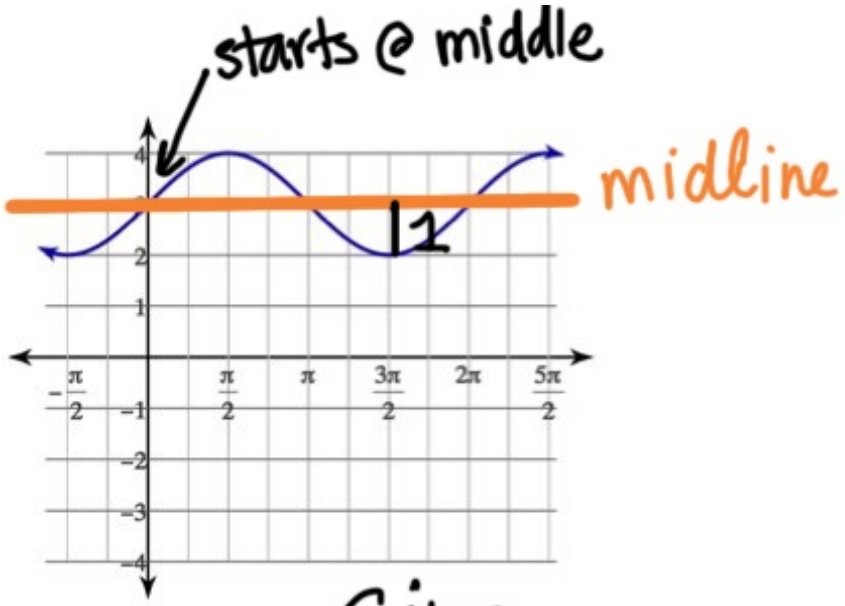
10.4 Translating Sine and Cosine Graphs

Note: It says “10.3 Period and Phase Shift for Sine and Cosine” in your copy of the notes

$$y = a\sin\big(b(\theta - h)\big) + k$$



A.



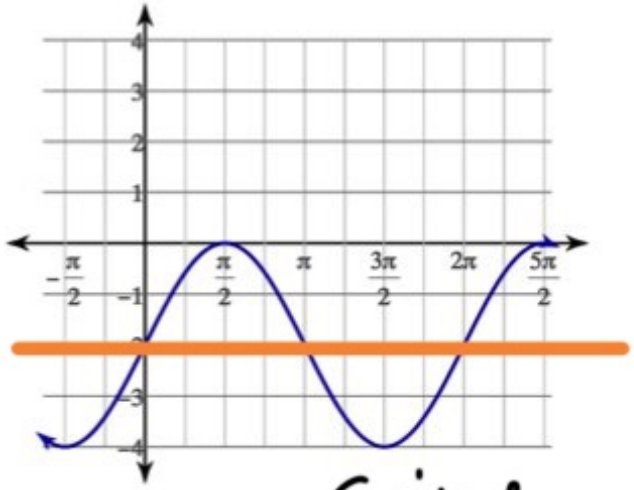
Sine/Cosine? Sine

Amplitude: 1

Midline: $y = 3$

Equation: $y = 1\sin\theta + 3$

B.



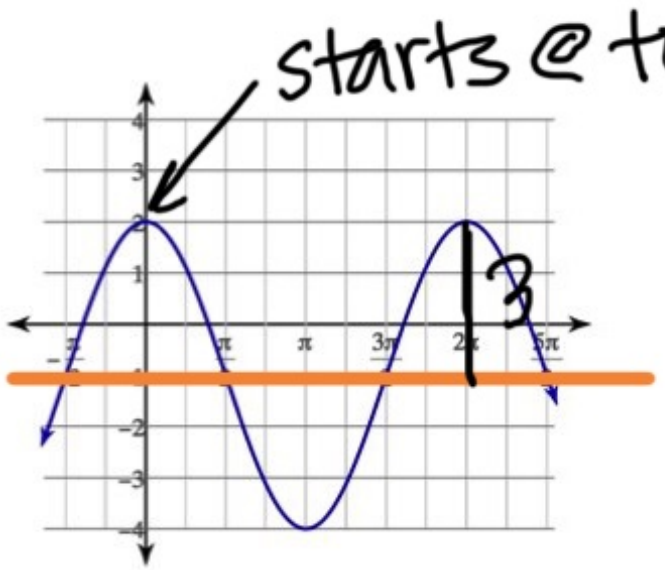
Sine/Cosine? Sine

Amplitude: 2

Midline: $y = -2$

Equation: $y = 2\sin\theta - 2$

C.



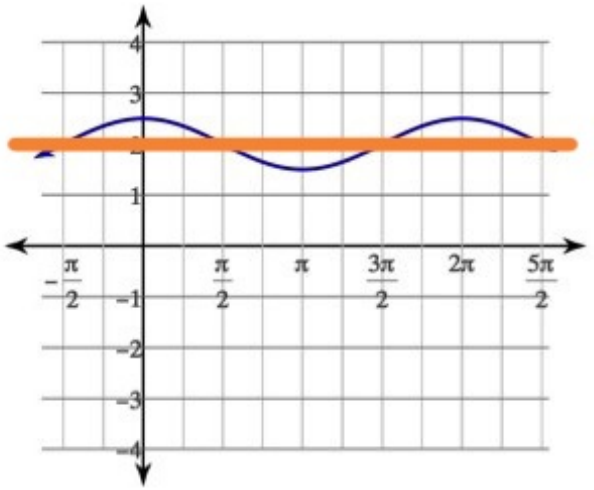
Sine/Cosine? cosine

Amplitude: 3

Midline: $y = -1$

Equation: $y = 3\cos\theta - 1$

D.



Sine/Cosine? cosine

Amplitude: 1/2

Midline: $y = 2$

Equation: $y = \frac{1}{2}\cos\theta + 2$

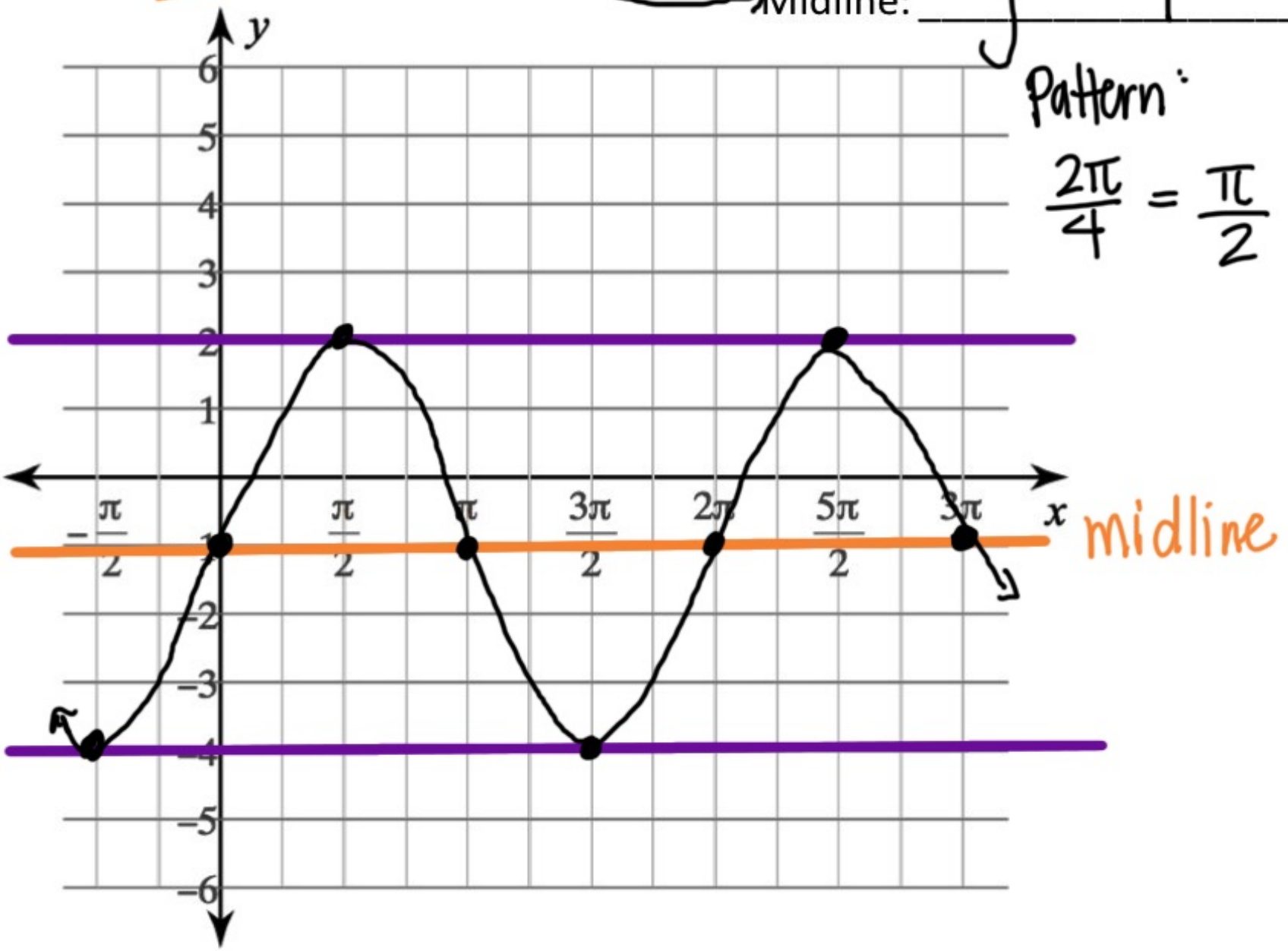
E. $y = 3\sin\theta - 1$

Amplitude: 3

Midline: $y = -1$

Pattern:

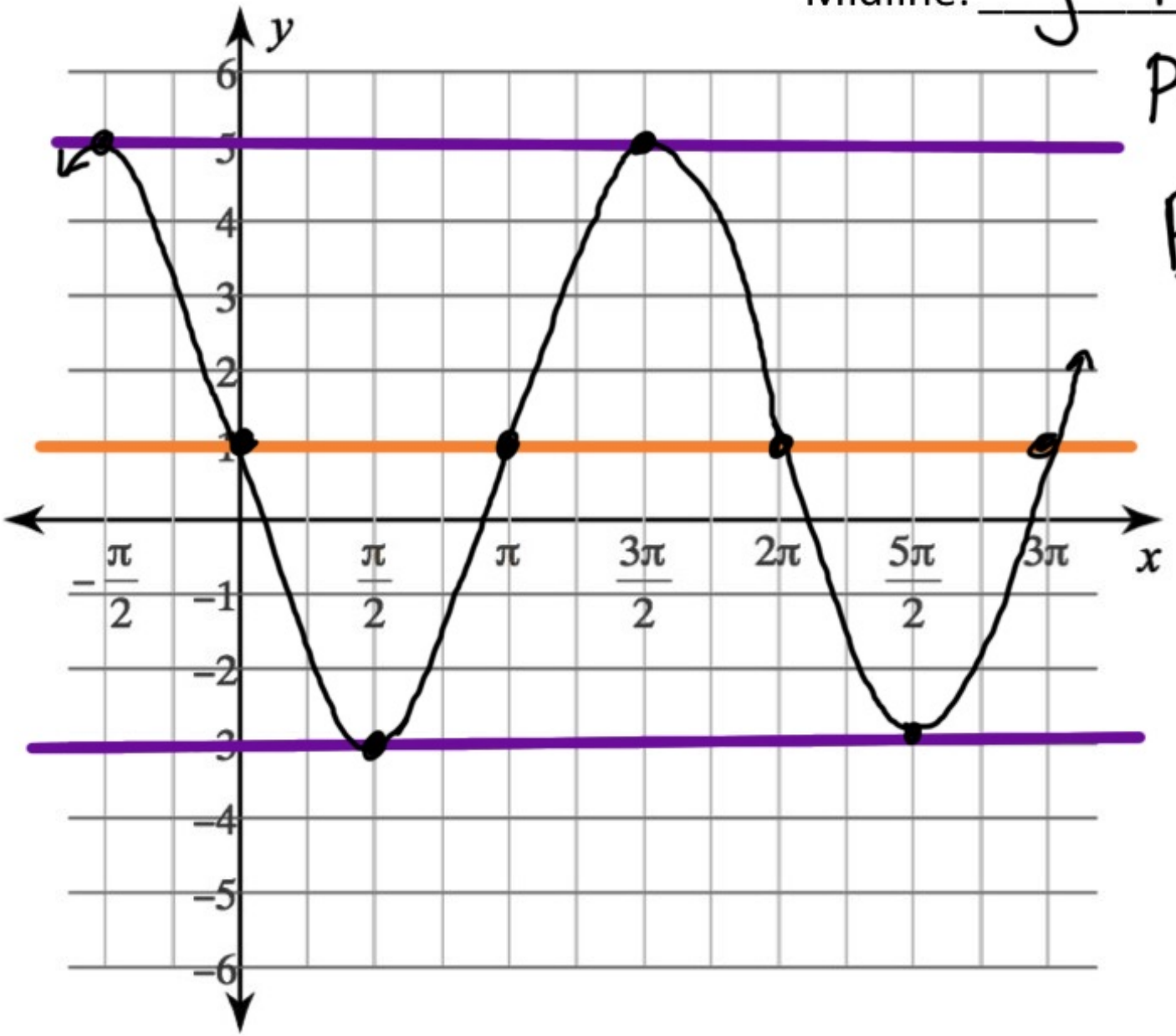
$\frac{2\pi}{4} = \frac{\pi}{2}$



F. $y = -4\sin\theta + 1$ (flip)

Amplitude: 4 (always +)

Midline: $y = 1$



period: 2π

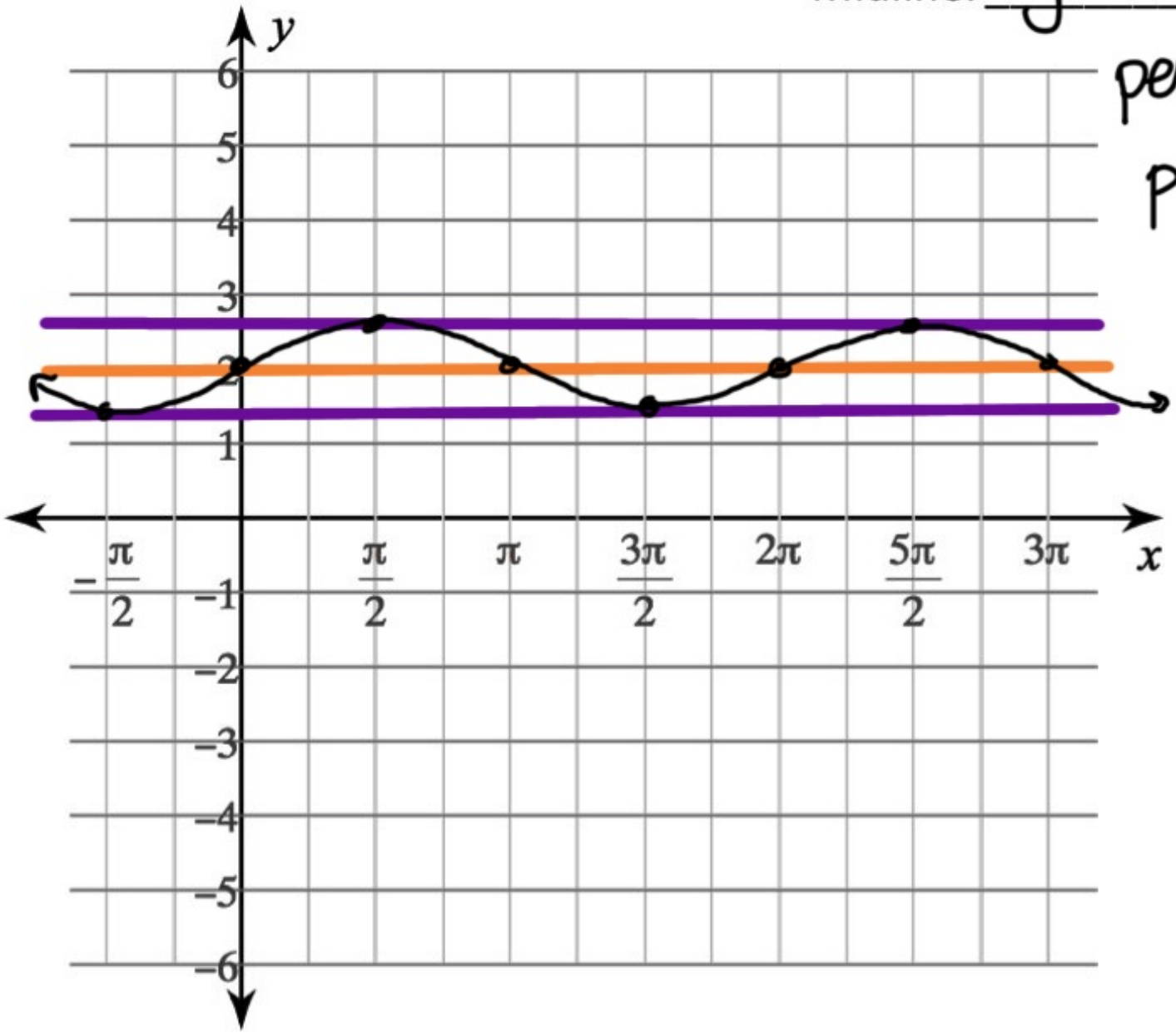
pattern:

$\frac{2\pi}{4} = \frac{\pi}{2}$

G. $y = \frac{1}{2}\sin\theta + 2$

Amplitude: $\frac{1}{2}$

Midline: $y=2$



period: 2π

pattern:

$\frac{2\pi}{4} = \frac{\pi}{2}$

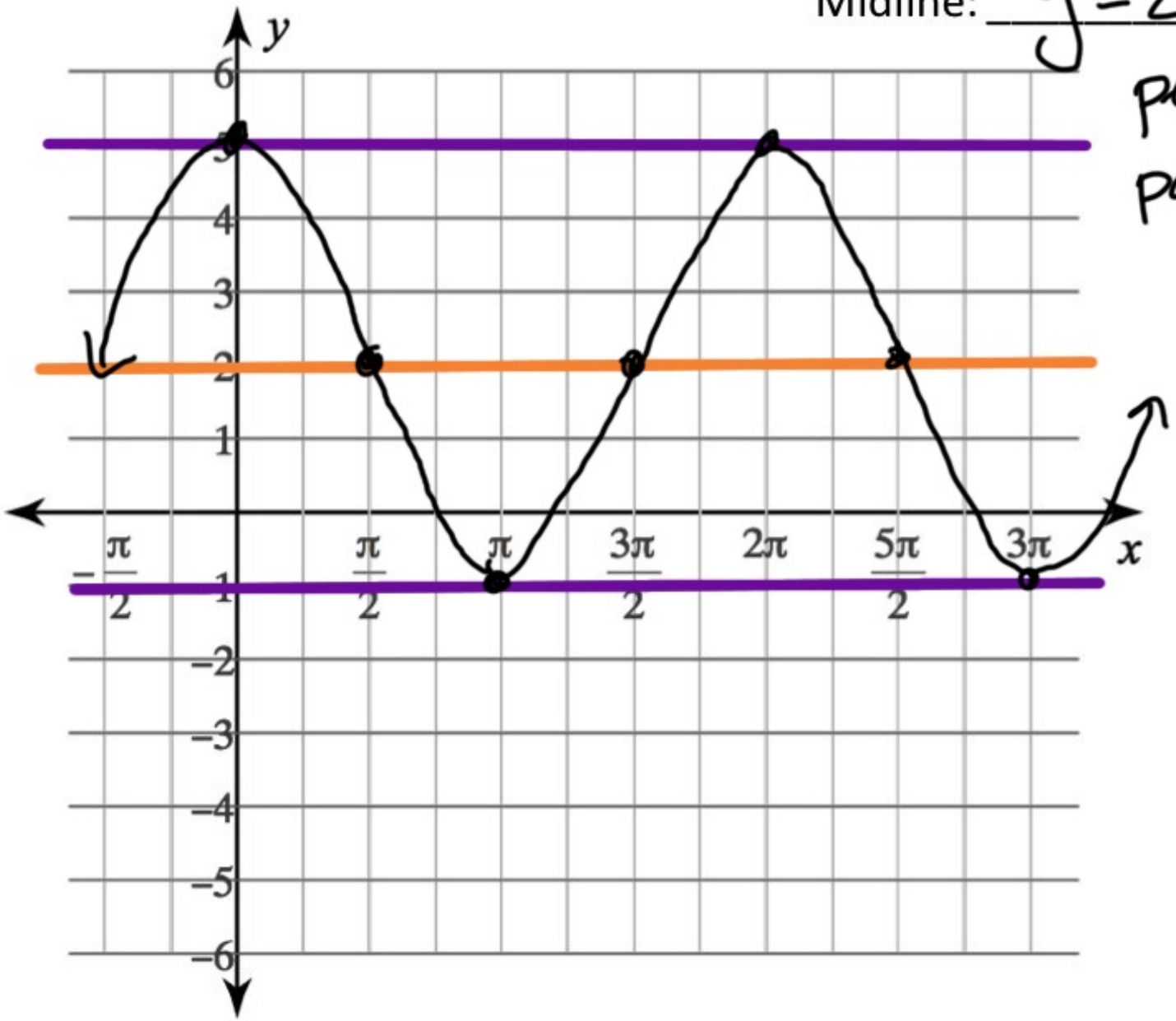
H. $y = 3\cos\theta + 2$

Amplitude: 3

Midline: $y = 2$

period: 2π

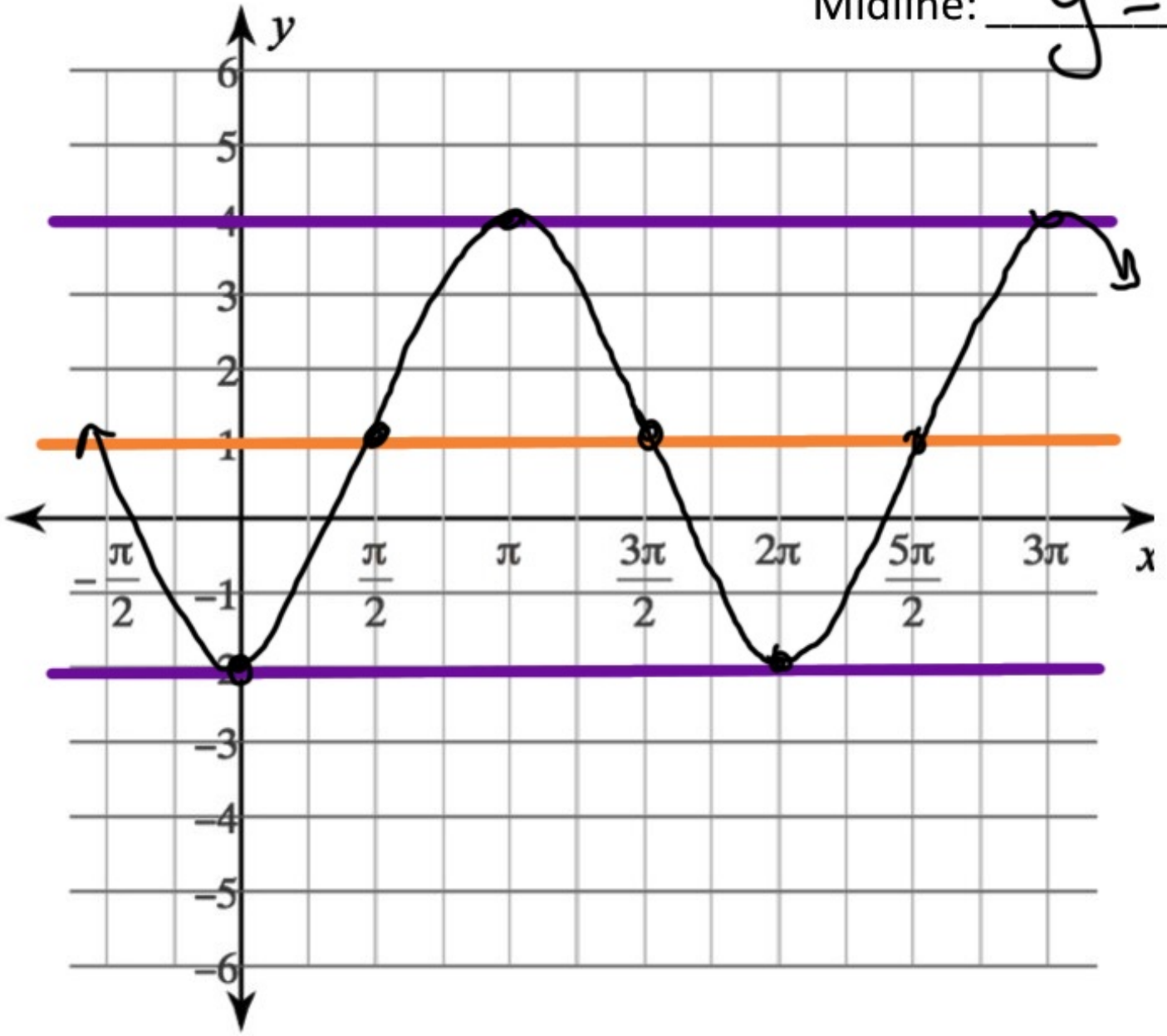
pattern: $\frac{2\pi}{4} = \frac{\pi}{2}$



1. $y = -3\cos\theta + 1$ (flip)

Amplitude: 3

Midline: $y = 1$



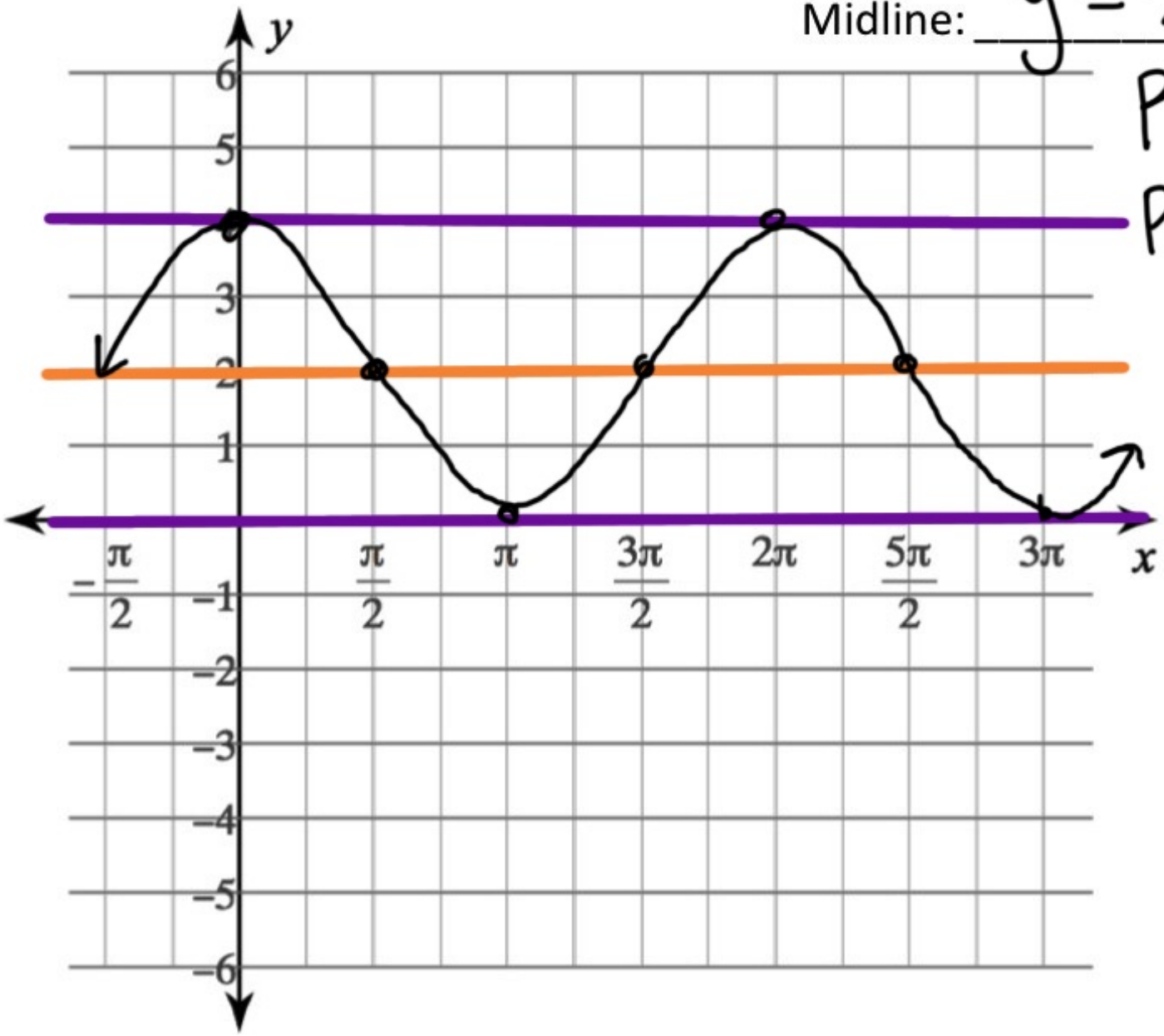
J. $y = 2\cos\theta + 2$

Amplitude: 2

Midline: $y = 2$

period: 2π

pattern: $\frac{2\pi}{4} = \frac{\pi}{2}$



A. $y = 2\sin\left(3\left(\theta - \frac{\pi}{4}\right)\right) + 1$

Amplitude: 2

Frequency: 3

Period: $\frac{2\pi}{3}$

Phase shift: Right $\frac{\pi}{4}$
(left/right)

Midline: $y = 1$

B. $y = -1\cos\left(\theta + \frac{\pi}{6}\right) - 4$

Amplitude: 1

Frequency: 1

Period: $\frac{2\pi}{1} = 2\pi$

Phase shift: left $\frac{\pi}{6}$

Midline: $y = -4$

C. $y = -3\cos\left(\frac{1}{4}(\theta + \pi)\right) + 0$

Amplitude: 3

Frequency: $\frac{1}{4}$

Period: $2\pi/\frac{1}{4} = \frac{2\pi}{1} \cdot \frac{4}{1} = 8\pi$

Phase shift: left π

Midline: $y = 0$

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

Amplitude: 2

Frequency: 4

Period: $\frac{2\pi}{4} = \frac{\pi}{2}$

Phase shift: Right $\frac{\pi}{2}$

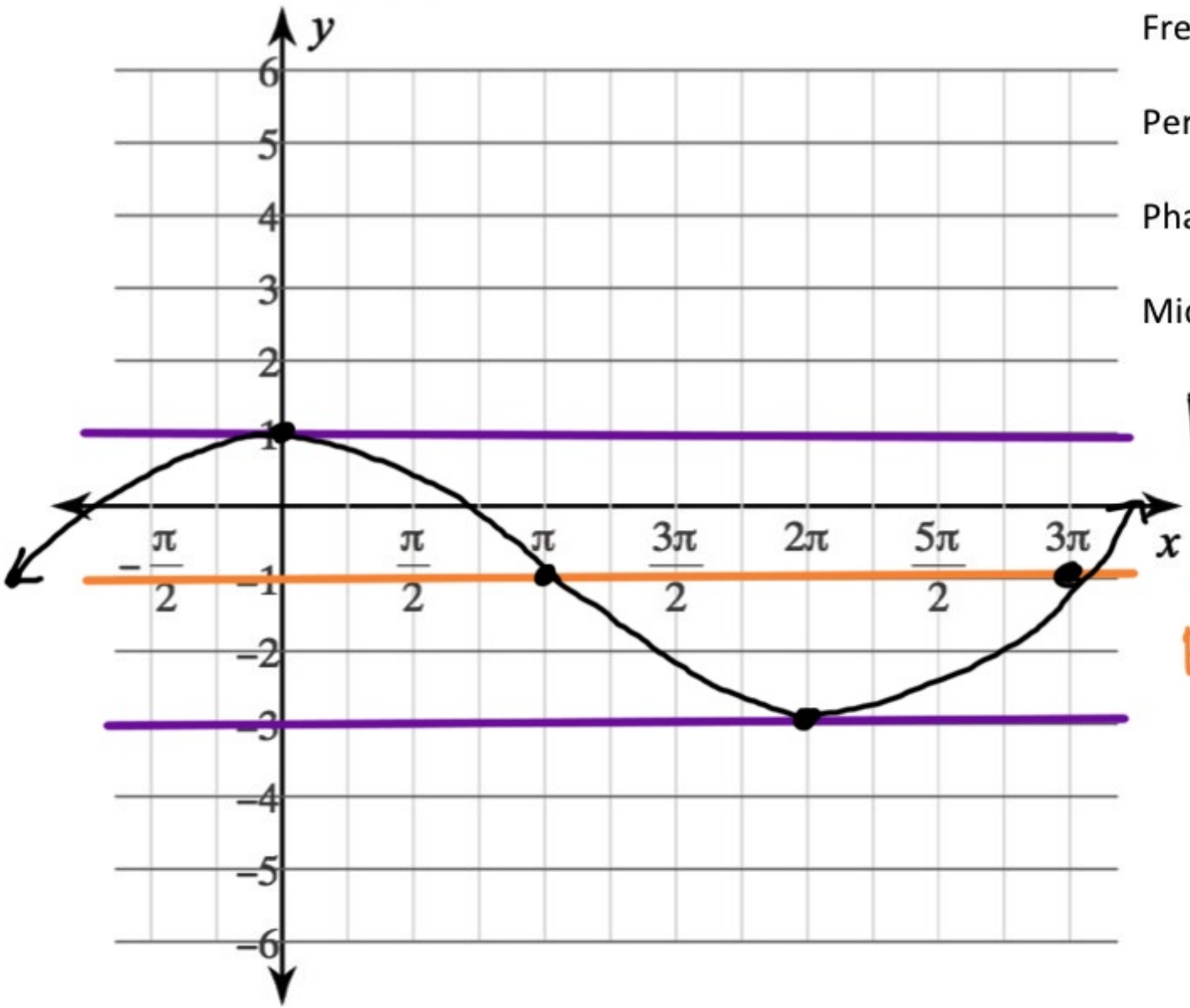
Midline: $y = -2$

Steps to graphing:

1. Identify the parent function. (sine/cosine)
2. Determine the amplitude, midline, period, and phase shift.
3. Mark the midline and phase shift on the graph (this is your new x- and y-axis).
4. Mark the 5-point pattern on the graph $\left(\frac{period}{4}\right)$.
5. Sketch pretty WAVE.

(on pg. 16 of the notes)

E. $y = 2\cos\left(\frac{1}{2}\theta\right) - 1$



Amplitude: 2

Frequency: $\frac{1}{2}$

Period: $\frac{2\pi}{1/2} = \frac{2\pi}{1} \cdot \frac{2}{1} = 4\pi$

Phase shift: None

Midline: $y = -1$

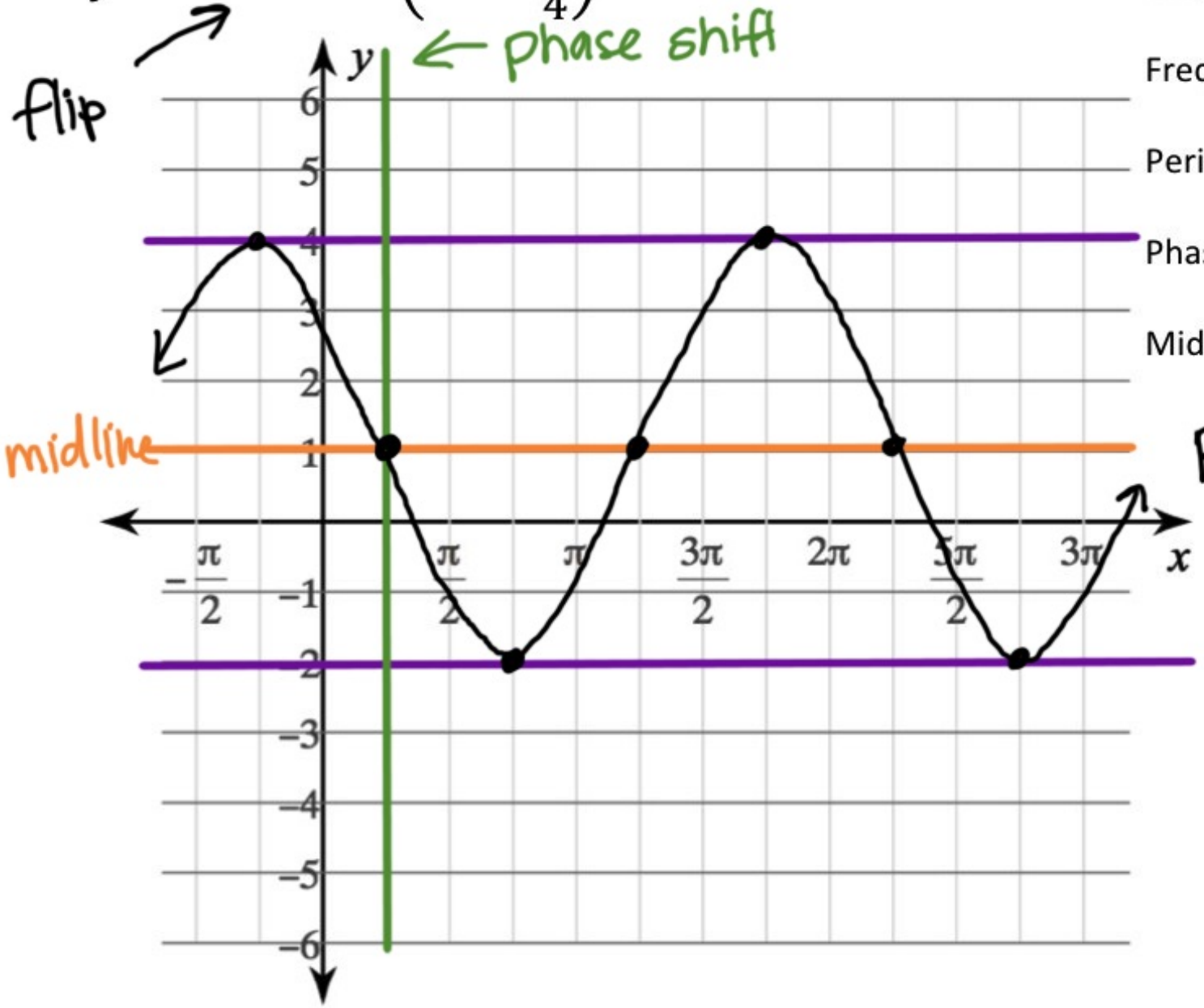
pattern:

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

period

F. $y = -3\sin\left(\theta - \frac{\pi}{4}\right) + 1$

flip



Amplitude: 3

Frequency: 1

Period: $\frac{2\pi}{1} = 2\pi$

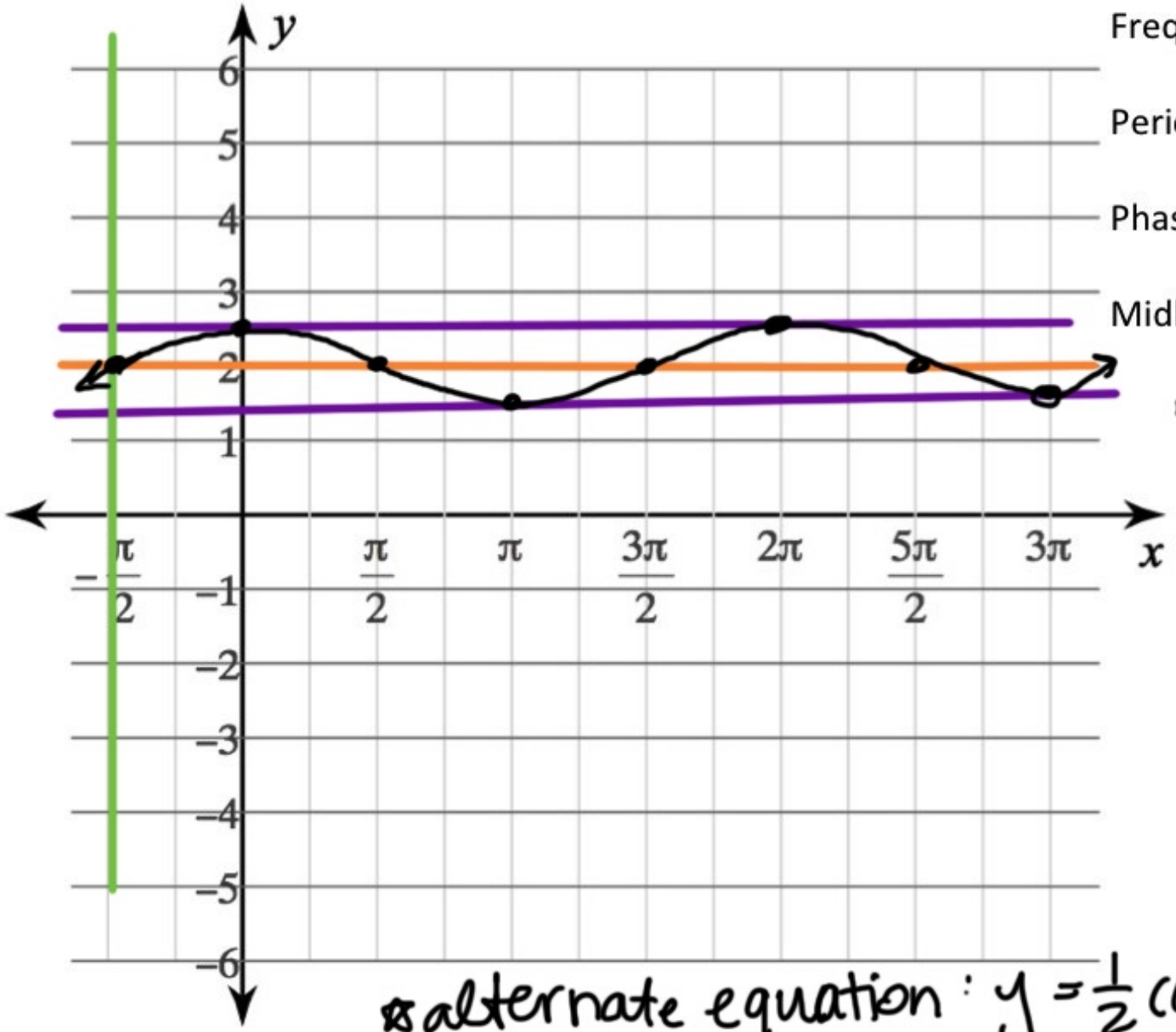
Phase shift: Right $\frac{\pi}{4}$

Midline: $y = 1$

pattern: $\frac{2\pi}{4} = \frac{\pi}{2}$

period

G. $y = \frac{1}{2}\sin\left(\theta + \frac{\pi}{2}\right) + 2$



Amplitude: $\frac{1}{2}$

Frequency: 1

Period: $\frac{2\pi}{1} = 2\pi$

Phase shift: left $\frac{\pi}{2}$

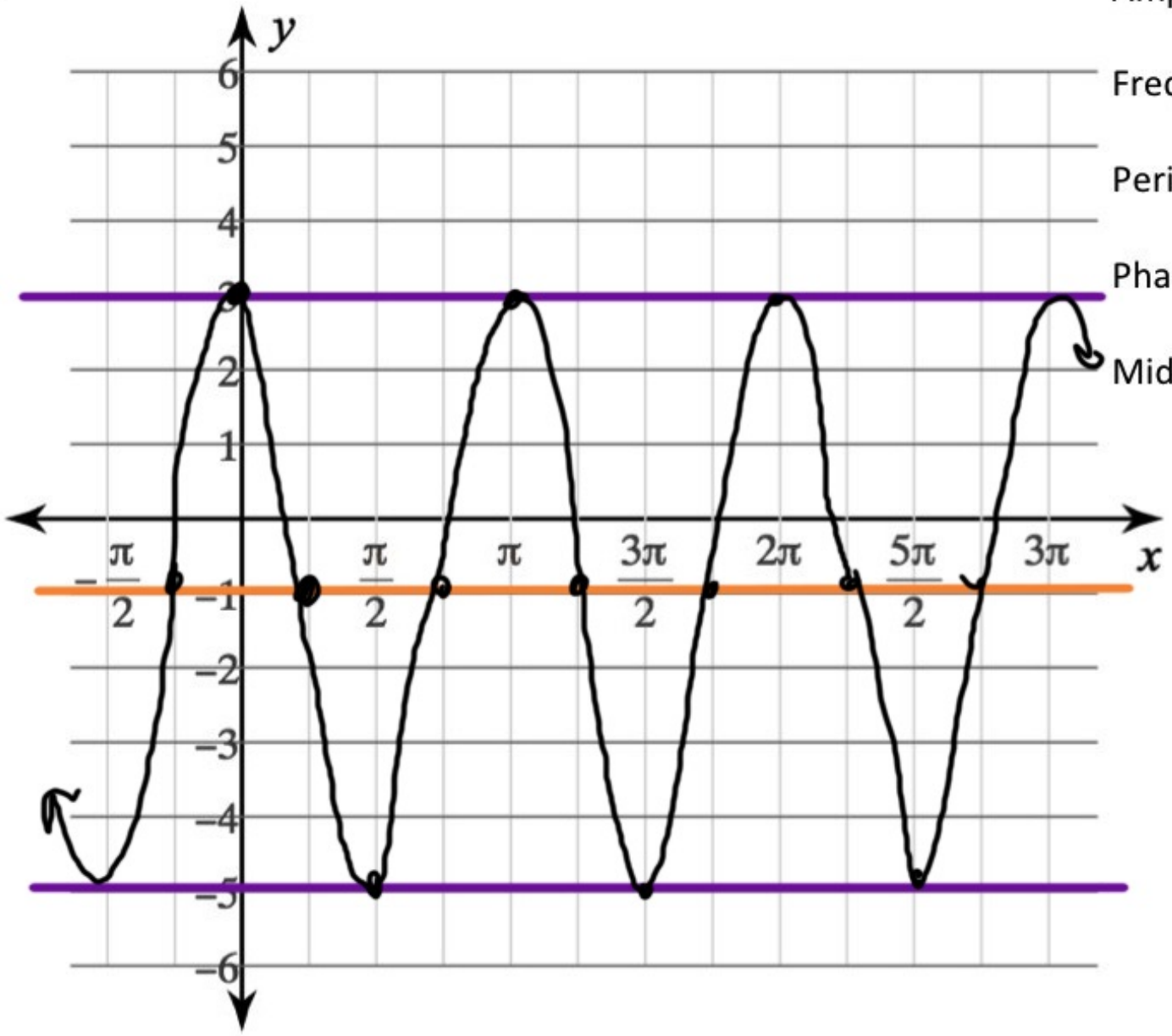
Midline: $y = 2$

pattern:

$\frac{2\pi}{4} = \frac{\pi}{2}$

*alternate equation: $y = \frac{1}{2}\cos\theta + 2$

H. $y = 4\cos(2\theta) - 1$



Amplitude: 4

Frequency: 2

Period: $\frac{2\pi}{2} = \pi$

Phase shift: None

Midline: $y = -1$

pattern: $\frac{\pi}{4}$ ← period

I. The cosine function that has been translated 2 units down and 5 units to the left

midline: $y=-2$ phase shift

$$y = \cos(\theta + 5) - 2$$

J. A sine function with an amplitude of 3 and a period of $\frac{\pi}{2}$ that has been shifted down 2 units and right 3 units

$a = 3$

period: $\frac{\pi}{2}$

midline: $y=-2$

phase shift: right 3

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

$$b = \frac{2\pi}{\text{period}} = \frac{2\pi}{\pi/2}$$

$$= \frac{2\pi}{1} \cdot \frac{2}{\pi} = 4$$