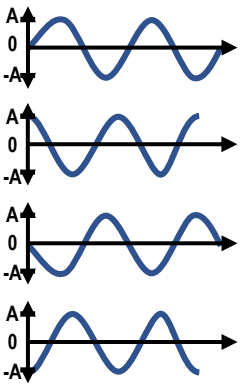
CONCEPT: WRITING WAVE FUNCTIONS USING THE PHASE CONSTANT



● Sometimes you'll have to write a wave function for a wave that *doesn't* begin at **y=0** or **y=±A**.

- We can write ANY wave function by using *either*

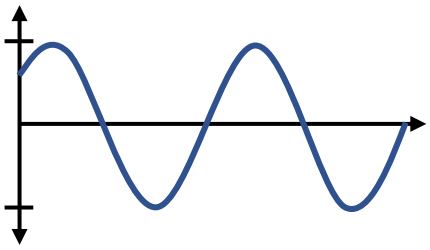
$$y(x,t) = A\sin(kx \pm \omega t \_\_\_\_)$$

$$y(x,t) = A\cos(kx \pm \omega t \_\_\_\_)$$

ϕ ("phi") = **phase constant** that "shifts" the graph left/right from its normal starting point.

If graph is shifted **RIGHT (+x)**, ϕ is **[+ | –]**
If graph is shifted **LEFT (–x)**, ϕ is **[+ | –]**

EXAMPLE**:** A transverse wave moving to the right has a wavenumber of 10 rad/m, angular frequency of 62.8 rad/s, and amplitude of 4m**.** At t = 0, the particle at x = 0 has a displacement of +3m**. a)** Write the wave function using a sine function**. b)** Write the wave function using a cosine function**.**



PHASE CONSTANT

1) Write $y(x,t)$ EQ with ϕ
2) Determine sign of ϕ
3) Plug in given values of t & x
4) Solve for ϕ
5) Write complete $y(x,t)$ EQ

● You can write the SAME wave function using sine *or* cosine, but the phase constant will be DIFFERENT**.**

PROBLEM**:** A wave traveling to the right has an Amplitude of 15cm, wavelength of 40cm, and oscillates 8 times per second**.** At t = 0, the displacement of a particle at x = 0 along this wave is +15cm**.** Write the wave function, including the phase constant, using a sine function**.**

A) $y(x,t) = 0.15\ sin(0.40x - 8t - 1.57)$
B) $y(x,t) = 0.15\ sin(15.7x + 50.3t)$
C) $y(x,t) = 0.15\ sin(15.7x - 50.3t + 1.57)$
D) $y(x,t) = 0.15\ sin(0.157x - 0.78t - 1.57)$

PHASE CONSTANT

1) Write $y(x,t)$ EQ with $\boldsymbol{\phi}$
2) Determine sign of $\boldsymbol{\phi}$
3) Plug in given values of t & x
4) Solve for $\boldsymbol{\phi}$
5) Write complete $y(x,t)$ EQ