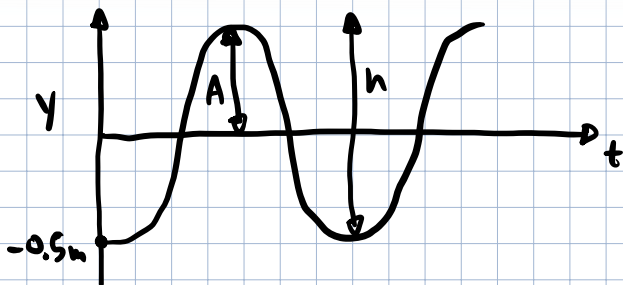
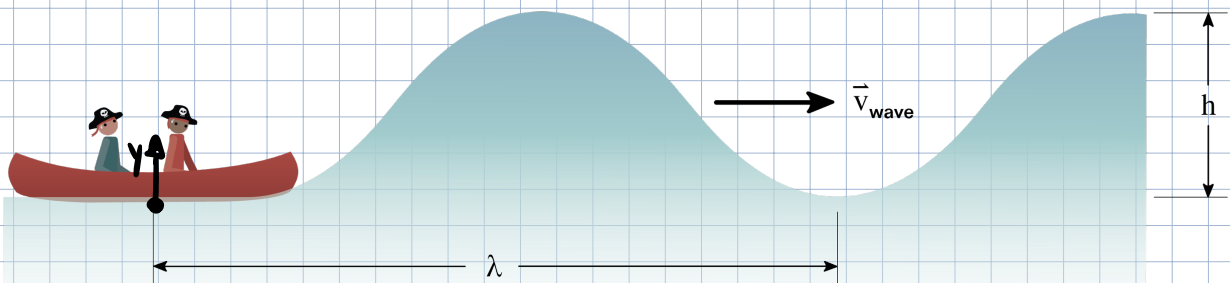


A small boat sits anchored in the ocean. The vertical displacement of the boat as a function of time is: $y(t) = 0.5 \cos(0.419t) \text{ m}$. Waves are measured to have a wavelength $\lambda = 15 \text{ m}$. What is the height and horizontal velocity of the waves with respect to the boat? Take the starting displacement of the boat to be at the bottom of the wave and y positive upward.



$$y(t) = -0.5 \cos(0.419t) = A \cos(\omega t + \phi)$$

Amplitude: $\rightarrow A = -0.5$ $h = 2A = 2(0.5\text{m}) = 1\text{m}$

$$h = 1\text{m}$$

Frequency: $\rightarrow \omega = 0.419 \frac{\text{rad}}{\text{s}}$ $\rightarrow v = \lambda f$ $\frac{1}{2} \omega = 2\pi f$

$$f = \frac{\omega}{2\pi} = \frac{(0.419)}{2\pi} = 0.0667 \text{ Hz}$$

$$v = \lambda f = (15\text{m})(0.0667\text{Hz}) = 1\text{m/s} = v$$

Phase: $\rightarrow \phi = 0$ \rightarrow no shift of cosine curve