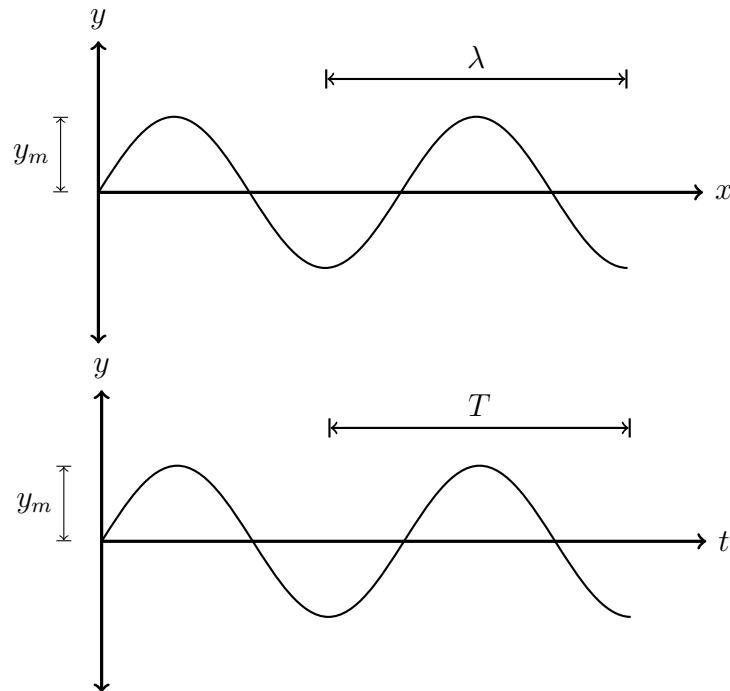


University Physics 1A

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December 7th, 2017

Waves



A wave pattern moves λ in T .

$$T = \frac{1}{f}$$

$$v = \frac{\text{how far it goes}}{\text{how long it takes}} = \frac{\lambda}{T} = \lambda f = \frac{\omega}{k}$$

The wave equation is of the form:

$$y = y_m \cos(kx - \omega t)$$

with k the angular wave number in radians per meter and ω the angular frequency in radians per second.

$$\omega = 2\pi f$$

$$k = \frac{2\pi}{\lambda}$$

For a wave moving through a string, the speed of the wave is:

$$v = \sqrt{\frac{\text{tension}}{\text{mass density}}} = \sqrt{\frac{F_{\text{tension}}}{\lambda}}$$

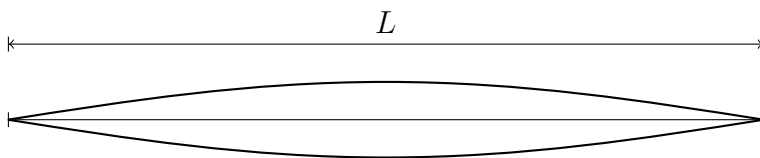
Note that the lambda above represents mass density in kilograms per meter.

Wave Interference

Two waves travelling in opposite directions with the same amplitude can be represented as:

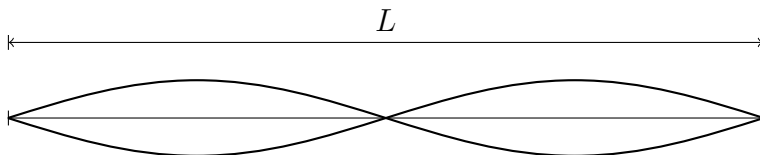
$$y = 2y_m \sin(kx) \cos(\omega t)$$

First harmonic (fundamental frequency):



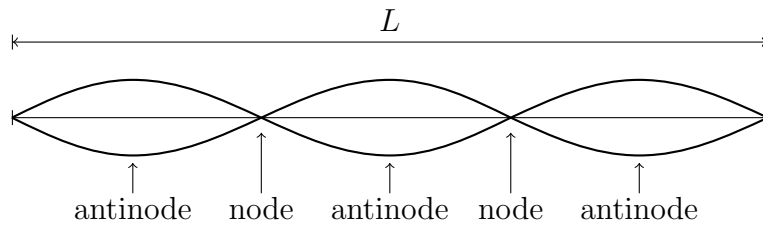
$$\lambda = 2L \quad f = \frac{v}{2L}$$

Second harmonic (first overtone):



$$\lambda = L \quad f = \frac{v}{L}$$

Third harmonic (second overtone):



$$\lambda = \frac{2L}{3} \quad f = \frac{3v}{2L}$$

You can find all my notes at <http://omgimanagerd.tech/notes>. If you have any questions, comments, or concerns, please contact me at alvin@omgimanagerd.tech