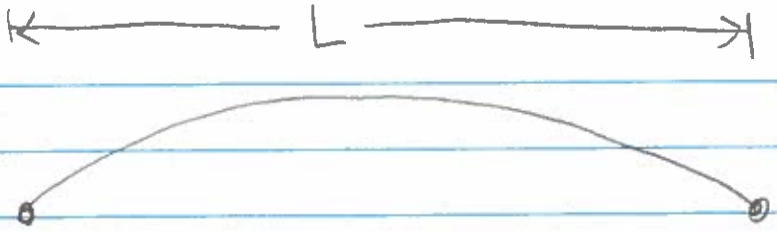
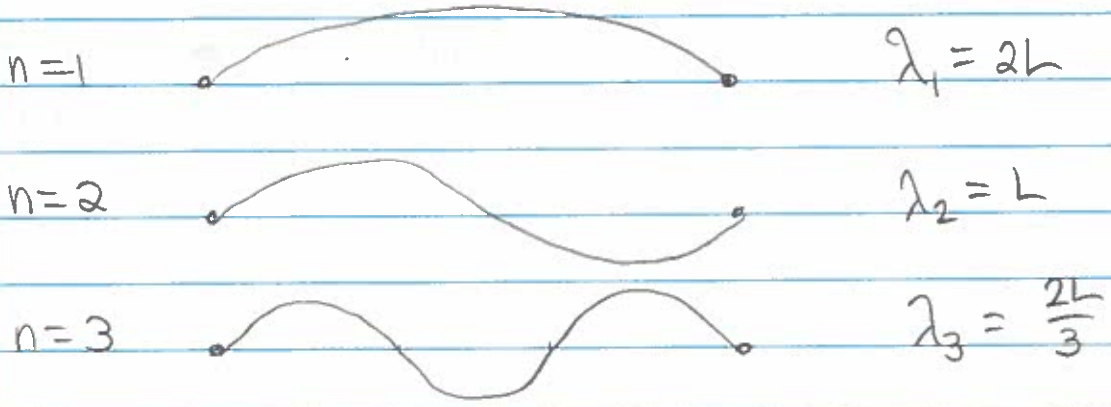


A piece of string of length L, mass M is stretched between two posts. It suffers uniform tension T all along its length.

What are the three lowest angular frequencies of vibration? In other words, what are the angular frequencies of the three lowest normal modes: $n=1$, $n=2$, $n=3$.

The shapes of the string in these modes are



The speed of waves on this string is

$$v = \sqrt{\frac{T}{\mu}} = \sqrt{\frac{T}{M/L}} = \sqrt{\frac{TL}{M}}$$

And since the speed of a wave is

$$v = \lambda f = \lambda \frac{\omega}{2\pi}$$

we can determine the angular frequency of each mode:

$$n=1 \qquad \omega_1 = \frac{2\pi V}{\lambda_1} = \frac{2\pi\sqrt{\frac{TL}{M}}}{2L} = \pi\sqrt{\frac{T}{ML}}$$

$$n=2 \qquad \omega_2 = \frac{2\pi V}{\lambda_2} = \frac{2\pi\sqrt{\frac{TL}{M}}}{L} = 2\pi\sqrt{\frac{T}{ML}}$$

$$n=3 \qquad \omega_3 = \frac{2\pi V}{\lambda_3} = \frac{2\pi\sqrt{\frac{TL}{M}}}{\frac{2}{3}L} = 3\pi\sqrt{\frac{T}{ML}}$$