Quiz 1

micro = 1×10^{-6}
nano = 1×10^{-9}
c = 3×10^{8} m/s
$v_{air} = 343$ m/s at room temperature and 1 atm.

$v = \sqrt{\frac{F_T}{\mu}}$ for a wave on a string.

$I = \frac{P}{A}$ and $P = \frac{\Delta E}{\Delta t}$. The intensity at a distance r from a point source of waves is $I = \frac{P_{source}}{4\pi r^2}$.

$f' = f\left(\frac{v \pm v_o}{v \mp v_s}\right)$ The upper sign in each case corresponds to the detector and source moving toward each other. The lower sign in each case corresponds to the detector and source moving away from each other.

$\lambda_n = \frac{2L}{n}$ and $f_n = n\frac{v}{2L}$ with $n = 1, 2, 3, ...$ if the standing wave has nodes on both ends or antinodes on both ends.

$\lambda_n = \frac{4L}{n}$ and $f_n = n\frac{v}{4L}$ with $n = 1, 3, 5, ...$ if the standing wave has a node on one end and an antinode on the other end.

$f_n = nf_1$ are the frequencies of the harmonics of a standing wave.

sound level: $\beta = (10 \text{ dB}) \log_{10}\left(\frac{I}{1 \times 10^{-12} \text{ W/m}^2}\right)$ relative sound level: $\Delta\beta = (10 \text{ dB}) \log_{10}\left(\frac{I_f}{I_i}\right)$

Interference of two sources that are in phase:

$$\begin{aligned} \text{Constructive:} \quad & \text{path difference} = |L_1 - L_2| = \Delta L &&= m\lambda \\ \text{Destructive:} \quad & \text{path difference} = |L_1 - L_2| = \Delta L &&= \left(m + \frac{1}{2}\right)\lambda \end{aligned}$$