PHY 2048C

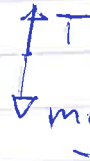
Solution to Practice Quiz 8.

Problem 1

Wave eqn. $\frac{\partial^2 \psi}{\partial x^2} = \frac{1}{v_{wave}^2}\frac{\partial^2 \psi}{\partial t^2}$ for string $\rightarrow \frac{\partial^2 y}{\partial x^2} = \frac{\mu}{T}\frac{\partial^2 y}{\partial t^2}$

μ = mass per unit length, T = tension.

$\therefore v_{wave}^2 = \frac{T}{\mu}$



$\sum F_y = 0$

$T = mg$

$v_{wave_0}^2 = \frac{mg}{\mu}$: Then, a mass M is added

$v_{wave_2}^2 = \frac{(m+M)g}{\mu} = \frac{\left(v_{wave_0}^2 \frac{\mu}{g} + M\right)g}{\mu}$

$M = \left(v_{wave_2}^2 - v_{wave_0}^2\right)\frac{\mu}{g} = \left(45^2 - 20^2\right)\frac{5.6}{9.81} =$

Problem 2.

The pressure or density of the air oscillates during a sound wave. It oscillates in the direction of the wave propagation.

Problem 3. At the surface $C = P_{atm} + \frac{1}{2}\rho V_{surface}^2$

At the jet level $C = P_{atm} + \frac{1}{2}\rho V_{jet}^2 + \rho g h$

$V_{surface} A_t = V_{jet} A_j$ - free fall $\frac{1}{2}\rho\left(V_s^2 - V_{jet}^2\right) = \rho g h$; =

$X = V_{jet} t_{right}$: $t_{right} = \sqrt{\frac{2H}{g}}$ $\frac{1}{2}\rho V_{jet}^2\left(\frac{A_j}{A_t} - 1\right) = \rho g h \Rightarrow V_{jet} = \sqrt{\frac{2\rho g h}{\left(\frac{A_j}{A_t} - 1\right)}}$

$X = \sqrt{\frac{2\rho g h}{\left(\frac{A_j}{A_t} - 1\right)}}\sqrt{\frac{2H}{g}}$ $\rightarrow$ Maximize. $X' = 2\rho g(h_0 - H)H$

close A_{jet} $\frac{\partial X}{\partial H} = 2\rho g h_0 - 4\rho g H = 0 \Rightarrow \boxed{H = \frac{h_0}{2}}$