

PHYS-201 Equation Sheet for Midterm Exam #1
(10/25/2012, MAIN AUDITORIUM, 8:00-8:50 AM)

Periodic Motion

$$\begin{aligned}
 F_x &= -kx & x(t) &= A \cos(\omega t + \Phi) \\
 \omega &= \sqrt{\frac{k}{m}} & T &= \frac{2\pi}{\omega} = \frac{1}{f} \\
 E &= K + U & E &= \frac{1}{2}mv^2 + \frac{1}{2}kx^2 = \frac{1}{2}kA^2 \\
 \omega &= \sqrt{\frac{g}{L}} & \omega &= \sqrt{\frac{mgd}{I}} \\
 x(t) &= A \exp\left(-\frac{bt}{2m}\right) \cos(\omega t + \Phi) & \omega &= \sqrt{\frac{k}{m} - \left(\frac{b}{2m}\right)^2}
 \end{aligned}$$

Mechanical Waves

Note that F is a tension in a string.

$$\begin{aligned}
 y(x, t) &= A \cos(kx - \omega t) & k &= \frac{2\pi}{\lambda} \\
 \omega &= \frac{2\pi}{T} = 2\pi f & v &= \frac{\omega}{k} = \lambda f \\
 v &= \sqrt{\frac{F}{\mu}} & P_{av} &= \frac{1}{2}\mu\omega^2 A^2 v = \frac{1}{2}\sqrt{F\mu}\omega^2 A^2 \\
 f_n &= \frac{n}{2L} \sqrt{\frac{F}{\mu}} & (n &= 1, 2, 3, \dots) \\
 f_n &= n \frac{v}{2L} & (n &= 1, 2, 3, \dots)
 \end{aligned}$$

Sound Waves

$$\begin{aligned}
 y(x, t) &= A \cos(kx - \omega t) & p(x, t) &= -B \frac{\partial y(x, t)}{\partial x} \\
 p_{max} &= BkA & v &= \sqrt{\frac{B}{\rho}} \\
 I &= \frac{1}{2}B\omega k A^2 = \frac{1}{2}\sqrt{\rho B}\omega^2 A^2 & I &= \frac{p_{max}^2}{2\rho v} = \frac{p_{max}^2}{2\sqrt{\rho B}} \\
 f_n &= n \frac{v}{2L} & (n &= 1, 2, 3, \dots) \\
 f_n &= n \frac{v}{4L} & (n &= 1, 3, 5, \dots)
 \end{aligned}$$