Physics 110
Equation List
Final Exam

$\rho = m/V$

$\bar{v} = \frac{\Delta x}{\Delta t}$

$\bar{a} = \frac{\Delta v}{\Delta t}$

$F = ma$

$x = v_o t + \frac{1}{2} a t^2$

$v = v_o + at$

$v^2 = v_o^2 + 2a\Delta x$

Reynolds $R = \frac{L\rho v}{\eta}$

$F_f = \frac{1}{2} C \rho A v^2$

$F_f = f v$

$F = -kx$

$x(t) = A\cos(\omega t)$

$v(t) = -A\omega \sin(\omega t)$

$\omega = \sqrt{\frac{k}{m}}$

$T = \frac{2\pi}{\omega} = \frac{1}{f}$

$\frac{F}{A} = Y \frac{\Delta L}{L_o}$

$W = Fx$ (in 1 dim)

$W_{spring} = -\frac{1}{2} k x^2$

$KE = \frac{1}{2} m v^2$

$W_{net} = \Delta KE$

$PE_{grav} = mgy$

$PE_{spring} = \frac{1}{2} k x^2$

$E = KE + PE_{grav} + PE_{spring} =$ constant (no friction)

$F_x = -\frac{\Delta PE}{\Delta x}$

$P = \frac{\Delta W}{\Delta t} = Fv$

$a_{cent} = \frac{v^2}{r}$

$W = F_x \Delta x = F \cos\theta \, \Delta x$

$F_{kfr} = \mu_k F_N$

$F_{sfr} \le \mu_s F_N$

$s = \frac{v_r}{a_{cent}}$

$\vec{p} = m\vec{v}$

$\vec{F}_{net} = \frac{d\vec{p}}{dt}$ (on particle)

$\text{Impulse} = \bar{F}\Delta t = \Delta p$

$x_{cm} = \frac{m_1 x_1 + m_2 x_2}{m_1 + m_2}$

$\vec{F}_{net,ext} = M\vec{a}_{cm} = \frac{d\vec{P}_{cm}}{dt}$

$\vec{P}_{cm} = \text{constant (if } \vec{F}_{net} = 0)$

$\omega = \omega_o + \alpha t$

$\theta(t) = \theta_o + \omega_o t + \frac{1}{2}\alpha t^2$

$\omega^2 = \omega_o^2 + 2\alpha\Delta\theta$

$s = r\theta$

$v = r\omega$

$a_{tang} = r\alpha$

$I = \Sigma m r^2$

$KE = \frac{1}{2} I \omega^2$

$\tau = F_\perp r = r_\perp F$

$\tau_{net,ext} = I\alpha$

$L = I\omega = r p_\perp$

$\frac{dL}{dt} = \tau_{net,ext}$

$$\left.\begin{array}{l} \vec{F}_{net} = 0 \\ \tau_{\text{any point}} = 0 \end{array}\right\} \textit{static equilibrium}$$

$Q = Av = \text{constant}$

$P + \frac{1}{2}\rho v^2 + \rho g h = \text{constant}$

$v = \lambda f$

$y(x,t) = A\sin(kx \pm \omega t) = A\sin\left(\frac{2\pi}{\lambda}x \pm \frac{2\pi}{T}t\right)$

$v_{wave} = \sqrt{\frac{F_T}{(m/L)}}$

$\Delta P = \Delta P_{max} \sin(kx - \omega t)$

$\beta = (10\ dB)\log\frac{I}{I_o}$

$I = \frac{P}{A} = \frac{P}{4\pi r^2}$

Displacement node at closed end of tube; displacement anti-node at open end

Constants

$g = 9.8\ \text{m/s}^2$