

Physics 1210
 Spring 2016
 Prof. Jang-Condell

Equation Sheet For Exam #2

Kinematics $v_{\text{avg}} = \frac{x_2 - x_1}{t_2 - t_1} = \frac{\Delta x}{\Delta t}$ $\vec{v} = \frac{d\vec{r}}{dt}$ $a_{\text{avg}} = \frac{v_2 - v_1}{t_2 - t_1} = \frac{\Delta v}{\Delta t}$ $\vec{a} = \frac{d\vec{v}}{dt}$ $g = 9.80 \text{ m/s}^2$

$x_1 = x_0 + v_0 t + \frac{1}{2} a t^2$ $v_1 = v_0 + a t$ $v_1^2 = v_0^2 + 2a(x_1 - x_0)$ $a_{\text{rad}} = \frac{v^2}{R} = \frac{4\pi^2 R}{T^2}$

$\sum \vec{F} = m\vec{a}$ $\vec{w} = m\vec{g}$ $f_s \leq \mu_s N$ $f_k = \mu_k N$ $f = kv$ $f = Dv^2$ $f_{\text{spring}} = -kx$

Momentum/Impulse

$\vec{p} = m\vec{v}$ $J = \Delta(mv) = F\Delta t$ $x_{\text{cm}} = \frac{\sum m_i x_i}{\sum m_i}$

Work/Energy

$W = \vec{F} \cdot \vec{s} = Fs \cos\theta$ $K_1 + U_1 + W_{\text{other}} = K_2 + U_2$ $P = \frac{\Delta W}{\Delta t} = \vec{F} \cdot \vec{v}$

$W = \Delta K$ $K = \frac{1}{2}mv^2$ $U_{\text{spring}} = \frac{1}{2}kx^2$ $U_{\text{grav}} = mgy$ $F = -\frac{dU}{dx}$

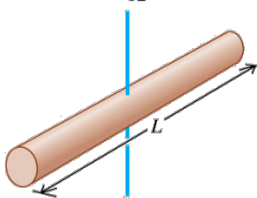
Angular Motion

$\omega = \frac{d\theta}{dt}$ $\alpha = \frac{d\omega}{dt}$ $\theta_1 = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2$ $\omega_1 = \omega_0 + \alpha t$ $\omega_1^2 = \omega_0^2 + 2\alpha(\theta_1 - \theta_0)$
 $s = r\theta$ $v = r\omega$ $a_{\text{tan}} = r\alpha$ $a_{\text{rad}} = \omega^2 r$ $2\pi = 360^\circ$

$I = \sum_i m_i r_i^2$ $I = I_{\text{cm}} + Md^2$

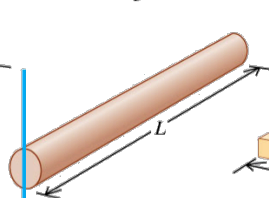
(a) Slender rod, axis through center

$I = \frac{1}{12}ML^2$



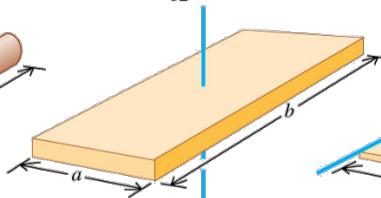
(b) Slender rod, axis through one end

$I = \frac{1}{3}ML^2$



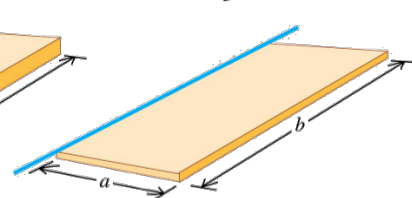
(c) Rectangular plate, axis through center

$I = \frac{1}{12}M(a^2 + b^2)$



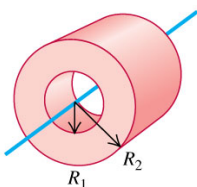
(d) Thin rectangular plate, axis along edge

$I = \frac{1}{3}Ma^2$



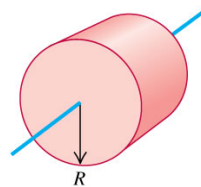
(e) Hollow cylinder

$I = \frac{1}{2}M(R_1^2 + R_2^2)$



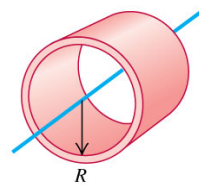
(f) Solid cylinder

$I = \frac{1}{2}MR^2$



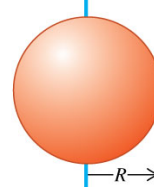
(g) Thin-walled hollow cylinder

$I = MR^2$



(h) Solid sphere

$I = \frac{2}{5}MR^2$



(i) Thin-walled hollow sphere

$I = \frac{2}{3}MR^2$

