Physics 31A 2nd Midterm Formula Sheet

$$W = Fs\cos\theta \quad W_{P_i\to P_f} = \int_{P_i}^{P_f} F(\vec{r})\cos\theta ds \quad W_{P_i\to P_f} = \int_{P_i}^{P_f} \vec{F}\cdot d\vec{s} \quad KE = \frac{1}{2}mv^2 \quad PE_G = mgh \quad PE_G = -\frac{GmM}{r}$$

$$\frac{1}{2}mv_{\mathrm{f}}^2 + mgh_{\mathrm{f}} = \frac{1}{2}m_i^2 + mgh_i \quad KE + PE = E = \text{constant} \quad v_{esc} = \sqrt{\frac{2GM}{R}} \quad \mathrm{P} = \frac{\Delta w}{\Delta t} \quad \vec{\mathrm{p}} = m\vec{v} \quad F_{av} = \frac{\Delta \mathrm{p}}{\Delta \mathrm{t}}$$

$$\vec{F}_{av}\Delta t = \Delta\vec{p} \quad F_{av}\Delta t = \Delta p \quad \vec{F}(t) = \lim_{\Delta t\to 0}\left[\frac{\Delta\vec{p}}{\Delta t}\right] = \frac{d\vec{p}}{dt} \quad \vec{p}_{\mathrm{f}} - \vec{p}_i = \int_{\mathrm{t_i}}^{t_{\mathrm{f}}} \vec{F}(t)dt$$

$$\theta = \frac{l}{r} \text{ or } l = r\theta \quad v = rw \quad a_t = r\alpha \quad w = w_0 + \alpha t \quad w_{av} = \frac{1}{2}(w_0 + w) \quad \theta = w_{av}t = \frac{1}{2}(w_0 + w)t$$

$$\theta = w_0 t + \frac{1}{2}\alpha t^2 \quad w^2 = w_0^2 + 2\alpha\theta \quad \tau_0 = Fr_\perp = F_\perp r = Fr\sin\theta \quad \vec{\tau}_0 = \vec{r}\times\vec{F} \quad \sum\tau_0 = 0$$

$$x_{cg} = \frac{\sum_{j=1}^{n} F_{wj}x_j}{\sum_{j=1}^{n} F_{wj}} \quad I_0 = \sum_j m_{\bullet j}r_j^2 \quad I = \int r^2 dm \quad \sum\tau_0 = I_0\alpha \quad KE_R = \frac{1}{2}Iw^2$$

$$L_0 = r_\perp p = r_\perp m_\bullet v \quad \vec{L}_0 = \vec{r}\times\vec{p} \quad L_0 = I_0 w \quad \vec{L}_0 = I_0\vec{w} \quad \vec{\tau} = \frac{d\vec{L}}{dt}$$

$$\rho = \frac{m}{V} \quad P = \frac{F_\perp}{A} \quad P_l = \rho gh \quad P = P_s + P_l = P_s + \rho gh \quad P = P_A + P_G \quad \frac{F_o}{F_i} = \frac{A_o}{A_i} \quad A_1v_1 = A_2v_2$$

$$P_1 + \frac{1}{2}\rho v_1^2 + \rho gy_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho gy_2 \quad \text{or} \quad P + \frac{1}{2}\rho v^2 + \rho gy = \text{constant} \quad v_2 = \sqrt{2gh}$$

$$F = ks \quad \Delta PE_e = \frac{1}{2}ks^2 \quad F = k\Delta L \quad \sigma = \frac{F}{A} \quad \varepsilon = \frac{\Delta L}{L_0} \quad \varepsilon_s = \gamma \approx \frac{\Delta x}{l_0} \quad Y = \frac{\sigma}{\varepsilon} \quad F = \frac{YA}{L_0}\Delta L$$

$$S = \frac{\sigma_s}{\varepsilon_s} = \frac{F/A}{\gamma} \quad B = -\frac{\sigma_v}{\varepsilon_v} = -\frac{F/A}{\Delta V/V_0} \quad f = \frac{1}{T} \quad w = 2\pi f = \frac{2\pi}{T} \quad x = A\cos\theta = x_{\max}\cos 2\pi ft$$

$$v_x = -Aw\sin wt = -2\pi f x_{\max}\sin 2\pi ft \quad v_x = -Aw\sin wt = \mp\vee_{\max}\sqrt{1-(x/A)^2} \quad a_x = -Aw^2\cos wt$$

$$a_x = -w^2x \quad f_0 = \frac{1}{2\pi}\sqrt{\frac{k}{m}} \quad T = 2\pi\sqrt{\frac{m}{k}} \quad f_0 \approx \frac{1}{2\pi}\sqrt{\frac{g}{L}}$$