PHY 2170/2175, Equations, Winter 2009

$$x - x_0 = v_0 + \frac{at^2}{2} = vt - \frac{at^2}{2} = \frac{(v+v_0)t}{2} \quad (1)$$

$$v^2 = v_0^2 + 2a(x - x_0) \quad (2)$$

$$v_{0,x} = v_0 \cos(\theta_0); \quad R = \frac{v_0^2 \sin(2\theta_0)}{g} \quad (3)$$

$$\vec{v}_{ab} = \vec{v}_{ac} + \vec{v}_{cb} \quad (4)$$

$$a_c = \frac{v^2}{r}; \quad T = \frac{2\pi r}{v} \quad (5)$$

$$f_{s,max} = \mu_s N; \quad f_k = \mu_k N \quad (6)$$

$$K = \frac{mv^2}{2} \quad (7)$$

$$W = \vec{F} \cdot \vec{d}; \quad W = \int_{\vec{r}_i}^{\vec{r}_f} \vec{F} \cdot d\vec{r} \quad (8)$$

$$F = -kx; \quad U_s = \frac{kx^2}{2} \quad (9)$$

$$F_g = mg; \quad U_g = mgy \quad (10)$$

$$F(x) = -\frac{dU(x)}{dx} \quad (11)$$

$$P = \frac{dW}{dt}; \quad P = \vec{F} \cdot \vec{v} \quad (12)$$

$$E_{mec} = K + U; \quad E_{tot} = E_{mech} + E_{int} \quad (13)$$

$$\vec{r}_{CM} = \frac{1}{M} \sum_{i=1}^{n} m_i \vec{r}_i; \quad M = \sum_{i=1}^{n} m_i \quad (14)$$

$$\vec{r}_{CM} = \frac{1}{M} \int \vec{r} dm \quad (15)$$

$$\vec{p} = m\vec{v}; \quad \vec{F}_{net} = \frac{d\vec{p}}{dt} \quad (16)$$

$$\Delta\vec{P} = \vec{I} = \int_{t_i}^{t_f} \vec{F}(t) dt \quad (17)$$

$$v_{1f} = \frac{m_1 - m_2}{m_1 + m_2} v_{1i} + \frac{2m_2}{m_1 + m_2} v_{2i} \quad (18)$$

$$\vec{r}_{cm} = \frac{1}{M} \sum_{i=1}^{n} m_i \vec{r}_i; \quad M = \sum_{i=1}^{n} m_i \quad (19)$$

$$a_r = \frac{v^2}{r} = \omega^2 r; \quad a_\tau = \alpha r \quad (20)$$

$$I = \sum m_i r_i^2 = \int r^2 dm \quad (21)$$

$$K = \frac{I\omega^2}{2}; \quad L = I\omega \quad (22)$$

$$\vec{\tau} = \vec{r} \times \vec{F} \quad (23)$$

$$\tau = rF \sin\theta = rF_\perp = r_\perp F \quad (24)$$

$$\tau_{net} = I\alpha \quad (25)$$

$$W = \int_{\theta_i}^{\theta_f} \tau d\theta \quad (26)$$

$$\vec{l} = \vec{r} \times \vec{p} = m(\vec{r} \times \vec{v}); \quad \frac{d\vec{l}}{dt} = \vec{\tau}_{net} \quad (27)$$

$$\vec{\tau}_{net} = 0; \quad \vec{F}_{net} = 0. \quad (28)$$

$$\frac{F}{A} = E\frac{\Delta L}{L}; \quad \frac{F}{A} = S\frac{\Delta x}{h} \quad (29)$$

$$F_g = G\frac{m_1 m_2}{r_{12}^2}; \quad a_g = \frac{GM}{r^2} \quad (30)$$

$$U_g = -\frac{GMm}{r} \quad (31)$$

$$v = \sqrt{\frac{2GM}{R}} \quad (32)$$

$$T^2 = (\frac{4\pi^2}{GM}) r^3 \quad (33)$$

$$G = 6.67 \times 10^{-11} \text{ N} \cdot \text{m}^2/\text{kg}^2 \quad (34)$$

$$\vec{a} \cdot \vec{b} = ab\cos\theta = a_x b_x + a_y b_y + a_z b_z \quad (35)$$