PHY 2170/2175, Equations, Winter 2009

$$v_{avg} = \frac{\Delta x}{\Delta t};\ \ a_{avg} = \frac{\Delta v}{\Delta t} \tag{1}$$

$$v = \frac{dx}{dt};\ \ a = \frac{dv}{dt} \tag{2}$$

$$x - x_0 = v_0 + \frac{at^2}{2} = vt - \frac{at^2}{2} = \frac{(v + v_0)t}{2} \tag{3}$$

$$v^2 = v_0^2 + 2a(x - x_0) \tag{4}$$

$$\vec{v} = \vec{v}_0 + \vec{a}t \tag{5}$$

$$\vec{r} - \vec{r}_0 = \vec{v}_0 t + \frac{\vec{a}t^2}{2} \tag{6}$$

$$v_{0,x} = v_0 \cos(\theta_0);\ \ R = \frac{v_0^2 \sin(2\theta_0)}{g} \tag{7}$$

$$\vec{v}_{ab} = \vec{v}_{ac} + \vec{v}_{cb} \tag{8}$$

$$a_c = \frac{v^2}{r};\ \ T = \frac{2\pi r}{v} \tag{9}$$

$$\vec{F}_{net} = m\vec{a} \tag{10}$$

$$W = mg \tag{11}$$

$$f_{s,max} = \mu_s N;\ \ f_k = \mu_k N \tag{12}$$

$$K = \frac{mv^2}{2} \tag{13}$$

$$W = \vec{F} \cdot \vec{d};\ \ W = \int_{\vec{r}_i}^{\vec{r}_f} \vec{F} \cdot d\vec{r} \tag{14}$$

$$F = -kx;\ \ U_s = \frac{kx^2}{2} \tag{15}$$

$$F_g = mg;\ \ U_g = mgy \tag{16}$$

$$F(x) = -\frac{dU(x)}{dx} \tag{17}$$

$$P = \frac{dW}{dt};\ \ P = \vec{F} \cdot \vec{v} \tag{18}$$

$$E_{mec} = K + U;\ \ E_{tot} = E_{mech} + E_{int} \tag{19}$$

$$\vec{r}_{CM} = \frac{1}{M}\sum_{i=1}^{n} m_i \vec{r}_i;\ \ M = \sum_{i=1}^{n} m_i \tag{20}$$

$$\vec{r}_{CM} = \frac{1}{M}\int \vec{r} dm \tag{21}$$

$$\vec{p} = m\vec{v} \tag{22}$$

$$\vec{F}_{net} = \frac{d\vec{p}}{dt} \tag{23}$$

$$v_f - v_i = v_{rel} \ln \frac{M_i}{M_f} \tag{24}$$

$$\Delta\vec{P} = \vec{I} = \int_{t_i}^{t_f} \vec{F}(t) dt \tag{25}$$

$$v_{1f} = \frac{m_1 - m_2}{m_1 + m_2} v_{1i} + \frac{2m_2}{m_1 + m_2} v_{2i} \tag{26}$$

$$\vec{a} \cdot \vec{b} = ab\cos\theta = a_x b_x + a_y b_y + a_z b_z \tag{27}$$

$$g = 9.8\ \mathrm{m/s^2} \tag{28}$$