$$y = y_o + v_{o_y}t + \frac{1}{2}a_y t^2 \qquad v_y = v_{o_y} + a_y t \qquad v_y^2 - v_{o_y}^2 = 2a_y(y - y_o)$$

$$x = x_o + v_{o_x}t + \frac{1}{2}a_x t^2 \qquad v_x = v_{o_x} + a_x t \qquad v_x^2 - v_{o_x}^2 = 2a_x(x - x_o)$$

$$y = y_o + v_{o_y}t - \frac{1}{2}gt^2 \qquad a = \frac{v^2}{r} \qquad T = \frac{2\pi r}{v} v_y = v_{o_y} - gt$$

$$v = \frac{\Delta x}{\Delta t} \qquad a = \frac{\Delta v}{\Delta t} \qquad R = \frac{v_o^2 \sin(2\theta_o)}{g} \qquad y_{max} = \frac{v_o^2 \sin^2\theta_o}{2g}$$

$$\vec{F}_{net} = m\vec{a} \qquad \left|\vec{F}\right| = m\frac{v^2}{r} \qquad f_k = \mu_k F_N \qquad f_s \le \mu_s F_N$$

$$W_g = mg \qquad g = 9.81 \text{m/s}^2 \qquad KE = \frac{1}{2}mv^2$$

$$PE = mgh \qquad W = \int \vec{F} \cdot d\vec{r} \qquad W = F\Delta r \cos\theta \qquad \vec{p} = m\vec{v}$$

$$v_{1_f} = \frac{m_1 - m_2}{m_1 + m_2} v_{1_i} + \frac{2m_2}{m_1 + m_2} v_{2_i} \qquad v_{2_f} = \frac{2m_1}{m_1 + m_2} v_{1_i} + \frac{m_2 - m_1}{m_2 + m_1} v_{2_i}$$

$$W = \Delta KE \qquad -\Delta PE = \Delta KE \qquad F_g = G\frac{Mm}{r^2}$$

$$\vec{\tau} = \vec{r} \times \vec{F} \qquad \tau = rF\sin\phi \qquad s = \theta r \qquad \omega = \frac{d\theta}{dt} \qquad \alpha = \frac{d\omega}{dt}$$

$$\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2 \qquad \omega = \omega_0 + \alpha t \qquad \omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0) \qquad I = I_{com} + Mh^2$$

$$v = \omega r \qquad a_t = \alpha r \qquad \vec{\tau}_{net} = I\vec{\alpha} \qquad \vec{\tau}_{net} = \frac{d\vec{L}}{dt} \qquad \vec{L} = I\vec{\omega} \qquad \vec{l} = \vec{r} \times \vec{p} = m(\vec{r} \times \vec{v})$$

$$KE = \frac{1}{2}I\omega^2 \qquad v_{com} = \omega R \qquad KE = \frac{1}{2}Mv_{com}^2 + \frac{1}{2}I_{com}\omega^2$$