$a_g = 9.8\ m/s^2$ (or $10\ m/s^2$)
$g = 9.8$ N/kg

$$\sin\theta = \frac{opp}{hyp} \quad \cos\theta = \frac{adj}{hyp} \quad \tan\theta = \frac{opp}{adj}$$

$$a^2 + b^2 = c^2$$

$$ax^2 + bx + c = 0 \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A_x = A\cos\theta_A \quad A_y = A\sin\theta_A$$

$$A = \sqrt{A_x^2 + A_y^2} \quad \theta_A = \arctan\frac{A_y}{A_x}*$$

$$\vec{A}\cdot\vec{B} = A_xB_x + A_yB_y + A_zB_z = AB\cos\theta_{A,B}$$

$$|\vec{A}\times\vec{B}| = AB\sin\theta_{A,B}(RHR)$$

$$\vec{A}\times\vec{B} = \begin{matrix} i & j & k & i & j \\ A_x & A_y & A_z & A_x & A_y \\ B_x & B_y & B_z & B_x & B_y \end{matrix}$$

$$\Delta x = x_f - x_i$$

$$v_{xAVE} = \frac{\Delta x}{\Delta t} \quad v_x = \lim_{x\to 0}\frac{\Delta x}{\Delta t} = \frac{dx}{dt}$$

$$a_{xAVE} = \frac{\Delta v_x}{\Delta t} \quad a_x = \lim_{x\to 0}\frac{\Delta v_x}{\Delta t} = \frac{dv_x}{dt}$$

$$v_x = v_{xi} + a_x t \quad v_{xAVE} = \frac{v_x + v_{xi}}{2}$$

$$x = x_i + v_{xi}t + \tfrac{1}{2}a_x t^2 \quad v_x^2 = v_{xi}^2 + 2a_x(x - x_i)$$

$$R = \frac{v_o^2\sin(2\theta_o)}{|a_g|} ORR = \frac{v_o^2\sin(2\theta_o)}{g}$$

$$\sum_n \vec{F}_n = m\vec{a}$$

$$\vec{F}_{A,B} = -\vec{F}_{B,A}$$

$$F_{fK} = \mu_K F_N$$

$$F_{fS} \le \mu_S F_N$$

$$a_C = \frac{v_T^2}{r} = \omega^2 r$$

$$s = r\theta$$

$$v_T = r\omega$$

$$\omega = \frac{d\theta}{dt}$$

$$W_{TOTAL} = \Delta K$$

$$W_{NC} = \Delta K + \Delta U$$

$$W = F\Delta x \cos\theta_{F,\Delta x} \quad W = \int \vec{F}(\vec{r}) \cdot d\vec{r}$$

$$F_x = -\frac{dU}{dx} \quad \vec{F} = -\frac{\partial U}{\partial x}\hat{i} - \frac{\partial U}{\partial y}\hat{j} - \frac{\partial U}{\partial z}\hat{k}$$

$$K = ½ mv^2 \quad U_g = gmy \quad U_{sp} = ½ kx^2 \quad \Delta U = -W_{CONS}$$

$$F_{SP} = (-)kx$$

$$P = \frac{\delta W}{dt}$$

$$\vec{J} = \vec{F}\Delta t = \Delta\vec{p} \quad \vec{J} = \int \vec{F}(t)dt = \Delta\vec{p} \quad \vec{p} = m\vec{v}$$

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

$$s = r\theta \quad v_T = r\omega \quad a_T = r\alpha$$

$$\omega_{AVE} = \frac{\theta_f - \theta_i}{t_f - t_i} \quad \vec{\omega} = \frac{d\vec{\theta}}{dt}$$

$$\alpha_{AVE} = \frac{\omega_f - \omega_i}{t_f - t_i} \quad \vec{\alpha} = \frac{d\vec{\omega}}{dt}$$

$$\omega = \omega_i + \alpha t \quad \omega_{AVE} = \frac{\omega + \omega_i}{2}$$

$$\theta = \theta_i + \omega_i t + ½ \alpha t^2 \quad \omega^2 = \omega_i^2 + 2\alpha(\theta - \theta_i)$$

$$\tau = F_{\perp} r = lF = F\sin\theta_{r,F}\,(RHR) \qquad \vec{\tau} = \vec{r} \times \vec{F}$$

$$\sum_n \vec{\tau}_n = I\vec{\alpha} \quad I = \sum_n m_n r_n^2 \quad I = \int dm\, r^2$$

$$x_{CM} = \frac{\sum_n m_n x_n}{\sum_n m_n} \quad x_{CM} = \frac{\int dm\, x}{\int dm} \quad \textit{Similarly for y and z}$$

$$I_{POINTMASS} = MR^2 \quad I_{HOOP} = MR^2$$

$$I_{DISK/CYLINDER} = \tfrac{1}{2} MR^2 \quad I_{SOLIDSPHERE} = \tfrac{2}{5} MR^2 \quad I_{THINROD} = \tfrac{1}{12} ML^2$$

$$K_{ROT} = \tfrac{1}{2} I\omega^2 \quad \vec{L} = I\vec{\omega} = \vec{r} \times \vec{p} \quad \vec{\tau} = \frac{d\vec{L}}{dt}$$

$$v = \lambda f \qquad f = \frac{1}{P}$$

$$v = \sqrt{\frac{T}{\mu}} \qquad v = \sqrt{\frac{B}{\rho}} \qquad v = \sqrt{\frac{Y}{\rho}} \qquad Z = \sqrt{Y\rho} \qquad Z = \sqrt{T\mu}$$

$$k_{EFF} = k_1 + k_2 + \ldots \;\; (side\ by\ side) \qquad \frac{1}{k_{EFF}} = \frac{1}{k_1} + \frac{1}{k_2} + \ldots \;\; (end\ 2\ end)$$

$$v(T) = (331 m/s)\sqrt{1 + \frac{T}{273}}$$

$$I = \frac{Power}{Area} \qquad dB = 10\ \log\frac{I}{I_0} \qquad I_0 = 10^{-12} W/m^2$$

$$f_n = \frac{nv}{2L}\ ;\ n = 1, 2, 3, \ldots \qquad f_n = \frac{nv}{4L}\ ;\ n = 1, 3, 5, \ldots$$

$$P = 2\pi\sqrt{\frac{M}{K}} \qquad P = 2\pi\sqrt{\frac{L}{g}}$$

$$\sin\theta \cong \theta_{radians}$$

$$f_{heard} = f_{emitted}\,\frac{v_{sound} \pm v_{observer}}{v_{sound} \mp v_{source}}$$

$$f_{heard} = \frac{f_1 + f_2}{2} \qquad f_{beat} = |\, f_1 - f_2 \,|$$