

Possibly useful relations:

$$x = x_0 + v_0 t + \frac{1}{2} a t^2$$

$$\vec{v}_{\text{average}} = \Delta \vec{x} / \Delta t$$

$$\vec{a} = d\vec{v}/dt$$

$$a_c = \frac{v^2}{r}$$

$$\vec{v}_B = \vec{v}_A + \vec{v}_{AB}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$W = F_x \Delta x$$

$$W = \int F_r dr = \int \vec{F} \cdot d\vec{r}$$

$$\Delta U = -W = -\int \vec{F} \cdot d\vec{r}$$

$$W_{nc} = \Delta E$$

$$M \vec{R}_{CM} = \sum m_i \vec{r}_i$$

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

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

$$a_T = r\alpha$$

$$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$$

$$K = \frac{1}{2} I \omega^2$$

$$\vec{\tau} = \frac{d\vec{L}}{dt}$$

$$\vec{A} \times \vec{B} = (AB \sin \theta) \hat{n}$$

$$\vec{L} = I\vec{\omega}$$

$$U(r) = +\frac{GM_E m}{R_E} - \frac{GM_E m}{r}$$

$$\vec{F}_{12} = -\frac{Gm_1 m_2}{r_{12}^2} \hat{r}_{12}$$

$$f = \frac{\omega}{2\pi}$$

$$T = 2\pi \sqrt{L/g}$$

$$x = A_0 e^{-(b/2m)t} \cos(\omega' t + \delta)$$

$$\omega' = \sqrt{\omega_0^2 - \frac{b^2}{4m^2}}$$

$$v = \sqrt{T/\mu}$$

$$P = \frac{1}{2} \mu \omega^2 A^2 v$$

$$v = \sqrt{B/\rho}$$

$$\beta = 10 \log(I/I_0)$$

$$\rho = M/V$$

$$F_{\text{Bouy.}} = W_{\text{disp.}}$$

$$v = v_0 + at$$

$$\vec{a}_{\text{average}} = \Delta \vec{v} / \Delta t$$

$$\vec{v} = d\vec{x}/dt$$

$$\vec{W} = m\vec{g}$$

$$R = \frac{v_0^2}{g} \sin 2\theta$$

$$0 \leq f_s \leq \mu_s F_n$$

$$W_{\text{net}} = \Delta K$$

$$E = K + U$$

$$U = mgy + U_0$$

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

$$M \vec{R}_{CM} = \int \vec{r} dm$$

$$\vec{F} = \frac{d\vec{P}}{dt}$$

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

$$\omega = \omega_0 + \alpha t$$

$$\vec{\tau} = I\vec{\alpha}$$

$$P = \tau \omega$$

$$V_{CM} = R\omega$$

$$\vec{\tau} = \vec{r} \times \vec{F}$$

$$X_{CG} W = \sum w_i x_i$$

$$U(r) = -\frac{GM_E m}{r}$$

$$\tau = r F \sin \theta$$

$$T = 1/f$$

$$x = A \cos(\omega t + \delta)$$

$$\tau = m/b$$

$$Q = 2\pi \frac{E}{\Delta E}$$

$$v = \lambda f$$

$$y_n(x, t) = A_n \cos(\omega_n t) (\sin k_n x)$$

$$v = \sqrt{\frac{\gamma RT}{M}}$$

$$I_0 = 10^{-12} \text{ W/m}^2$$

$$P = F/A$$

$$v_1 A_1 = v_2 A_2$$

$$v^2 = v_0^2 + 2a\Delta x$$

$$\vec{F}_{AB} = -\vec{F}_{BA}$$

$$\Sigma \vec{F} = m\vec{a}$$

$$F_x = -k\Delta x$$

$$v = \frac{2\pi r}{T}$$

$$f_k = \mu_k F_n$$

$$K = \frac{1}{2} m v^2$$

$$\vec{A} \cdot \vec{B} = AB \cos \phi$$

$$U = \frac{1}{2} k x^2$$

$$F(x) = -dU/dx$$

$$\vec{J} = \int \vec{F} dt = \vec{F}_a \Delta t = \Delta \vec{p}$$

$$v = r\omega$$

$$\theta = \theta_0 + \omega_0 t + \frac{1}{2} \alpha t^2$$

$$I = \sum m_i r_i^2$$

$$I = I_{CM} + M d^2$$

$$A_{CM} = R\alpha$$

$$\vec{L} = \vec{r} \times \vec{p}$$

$$T^2 = \frac{4\pi^2}{GM_s} R^3$$

$$v_E = \sqrt{2GM_E/R_E}$$

$$k = \frac{2\pi}{\lambda}$$

$$\omega = \sqrt{k/m}$$

$$E_{\text{Total}} = \frac{1}{2} k A^2$$

$$Q = \omega_0 \tau = 2\pi \frac{\tau}{T}$$

$$y(x, t) = A \sin(kx - \omega t)$$

$$p_0 = \rho v s_0$$

$$I = P_{av}/4\pi r^2$$

$$f = f_0 \left(\frac{v \pm v_r}{v \pm v_s} \right)$$

$$P = P_0 + \rho g y$$

$$P + \frac{1}{2} \rho v^2 + \rho g y = \text{const.}$$

$$G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2 \quad \rho_{H_2O} = 10^3 \text{ kg/m}^3$$

$$g = -9.8 \text{ m/s}^2$$