$$G = 6.67 \times 10^{-11}\ N \cdot m^2/kg^2$$
$$g = 9.8 m/s^2$$
$$c = 3.00 \times 10^8 m/s$$
$$R_{\text{Earth}} = 6.37 \times 10^3 km$$
$$M_{\text{Earth}} = 5.97 \times 10^{24} kg$$
$$\rho_{\text{air}} = 1.225 kg/m^3$$
$$\rho_{\text{ice}} = 0.92 \times 10^3 kg/m^3$$
$$\rho_{\text{water}} = 1.00 \times 10^3 kg/m^3$$
$$\rho_{\text{blood}} = 1.06 \times 10^3 kg/m^3$$
$$\rho_{\text{lead}} = 11.3 \times 10^3 kg/m^3$$
$$N_{\text{A}} = 6.02 \times 10^{23}\ \text{mol}^{-1}$$
$$m_{\text{e}} = 9.11 \times 10^{-31}\ kg$$
$$m_{\text{p}} = 1.67 \times 10^{-27}\ kg$$
$$1\text{ m} = 3.28\text{ ft}$$
$$1\text{ inch} = 2.54\text{ cm}$$
$$1\text{ mi} = 5280\text{ ft}$$
$$1\text{ lb} = 4.45\ N$$
$$1\text{atm} = 1.013 \times 10^5 Pa$$
$$C = 2\pi r \quad A = \pi r^2 \quad \text{SA} = 4\pi r^2 \quad V = \frac{4}{3}\pi r^3$$
$$\frac{d}{dx}(au) = a\frac{du}{dx}$$
$$\frac{d}{dx}(u+v) = \frac{du}{dx} + \frac{dv}{dx}$$
$$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}$$
$$\int dx = x$$
$$\int au\ dx = a\int u\ dx$$
$$\int x^m\ dx = \frac{x^{m+1}}{m+1} \quad (m \neq -1)$$
$$\Delta x = x_2 - x_1$$
$$\bar{v} = \frac{\Delta x}{\Delta t} = \frac{x_2 - x_1}{t_2 - t_1}$$
$$\bar{s} = \frac{\text{total distance}}{\Delta t}$$
$$v = \frac{dx}{dt}$$
$$\bar{a} = \frac{\Delta v}{\Delta t} = \frac{v_2 - v_1}{t_2 - t_1}$$
$$a = \frac{dv}{dt}$$
$$v = v_0 + at$$
$$x - x_0 = v_0 t + \frac{1}{2}at^2$$
$$v^2 = v_0^2 + 2a(x - x_0)$$
$$x - x_0 = \frac{1}{2}(v_0 + v)t$$
$$x - x_0 = vt - \frac{1}{2}at^2$$
$$a_x = a\cos\theta$$
$$a_y = a\sin\theta$$
$$a = \sqrt{a_x^2 + a_y^2}$$
$$\tan\theta = \frac{a_y}{a_x}$$
$$\theta_A = \tan^{-1}\frac{A_y}{A_x}\ [\cdots + 180^o]$$
$$\vec{a} \cdot \vec{b} = ab\cos\phi$$
$$\vec{a} \cdot \vec{b} = A_x B_x + A_y B_y + A_z B_z$$
$$\vec{a} \times \vec{b} = \vec{c}$$
$$c = ab\sin\phi$$
$$\vec{v} = \frac{d\vec{r}}{dt}$$
$$\vec{a} = \frac{d\vec{v}}{dt}$$
$$x - x_0 = v_{0x} t$$
$$y - y_0 = v_{0y} t - \frac{1}{2}gt^2$$
$$y = (\tan\theta_0)\,x - \frac{gx^2}{2\,(v_0\cos\theta_0)^2}$$
$$R = \frac{v_0^2}{g}\sin(2\theta_0)$$
$$a = \frac{v^2}{r}$$
$$a = \frac{4\pi^2 r}{T^2}$$
$$T = \frac{2\pi r}{v}$$
$$\Sigma\vec{F} = m\vec{a}$$
$$W = mg$$
$$\vec{F}_{\text{AB}} = -\vec{F}_{\text{BA}}$$
$$f = \mu N$$
$$F = \frac{mv^2}{r}$$
$$K = \frac{1}{2}mv^2$$
$$\Delta K = K_f - K_i = W$$
$$W = Fd\cos\phi$$
$$W = \vec{F} \cdot \vec{d}$$
$$W_g = mgd\cos\phi$$
$$\Delta K = W_a + W_g$$
$$W = \int_{x_i}^{x_f} F(x)\ dx$$
$$F = -kx$$
$$W_s = -\frac{1}{2}kx^2$$
$$\bar{P} = \frac{W}{\Delta t}$$
$$P = \frac{dW}{dt}$$

$$P = \vec{F} \cdot \vec{v}$$
$$U = mgy$$
$$U(x) = \frac{1}{2}kx^2$$
$$E = K + U$$
$$F(x) = -\frac{dU(x)}{dx}$$
$$W_{\text{app}} = \Delta E$$
$$\Delta E = -f_k d$$
$$P = \frac{dE}{dt}$$
$$x_{\text{com}} = \frac{m_1 x_1 + m_2 x_2}{m_1 + m_2}$$
$$x_{\text{com}} = \frac{1}{M}\int x\ dm$$
$$x_{\text{com}} = \frac{1}{V}\int x\ dV$$
$$\Sigma \vec{F}_{\text{ext}} = M\vec{a}_{\text{cm}}$$
$$\vec{p} = m\vec{v}$$
$$\Sigma \vec{F} = \frac{d\vec{p}}{dt}$$
$$\vec{P} = M\vec{v}_{\text{cm}}$$
$$\Sigma \vec{F}_{\text{ext}} = \frac{d\vec{P}}{dt}$$
$$\vec{P} = \text{constant}$$
$$\vec{J} = \int_{t_i}^{t_f} \vec{F}(t)\ dt$$
$$\vec{p}_f - \vec{p}_i = \Delta\vec{p} = \vec{J}$$
$$v_{1f} = \frac{m_1 - m_2}{m_1 + m_2} v_{1i}$$
$$v_{2f} = \frac{2m_1}{m_1 + m_2} v_{1i}$$
$$v_{cm} = \frac{P}{m_1 + m_2}$$
$$\theta = \tfrac{s}{r}$$
$$\Delta\theta = \theta_2 - \theta_1$$
$$\omega = \frac{d\theta}{dt}$$
$$\alpha = \frac{d\omega}{dt}$$
$$\omega = \omega_0 + \alpha t$$
$$\theta - \theta_0 = \omega_0 t + \frac{1}{2}\alpha t^2$$
$$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$$
$$\theta - \theta_0 = \frac{1}{2}(\omega_0 + \omega)t$$
$$\theta - \theta_0 = \omega t - \frac{1}{2}\alpha t^2$$
$$s = \theta r$$
$$v = \omega r$$
$$a_t = \alpha r$$

$$a_r = \frac{v^2}{r} = \omega^2 r$$
$$I = \Sigma m_i r_i^2$$
$$I = \int r^2 dm$$
$$K = \frac{1}{2}I\omega^2$$
$$\tau = rF\sin\phi$$
$$\tau = I\alpha$$
$$\Sigma\tau = I\alpha$$
$$v_{cm} = \omega R$$
$$K = \frac{1}{2}I_{cm}\omega^2 + \frac{1}{2}Mv_{cm}^2$$
$$\vec{\tau} = \vec{r} \times \vec{F}$$
$$\vec{l} = \vec{r} \times \vec{p} = m(\vec{r} \times \vec{v})$$
$$\Sigma\vec{\tau} = \frac{d\vec{l}}{dt}$$
$$L = I\omega$$
$$\rho = \frac{\Delta m}{\Delta V}$$
$$p = \frac{\Delta F}{\Delta A}$$
$$p_2 = p_1 + \rho g(y_1 - y_2)$$
$$p = p_0 + \rho g h$$
$$F_{\text{B}} = \rho_{\text{fl}} V_{\text{sub}} g$$
$$A_1 v_1 = A_2 v_2$$
$$p_1 + \frac{1}{2}\rho v_1^2 + \rho g y_1 = p_2 + \frac{1}{2}\rho v_2^2 + \rho g y_2$$
$$F = G\frac{m_1 m_2}{r^2}$$
$$U = -G\frac{m_1 m_2}{r}$$
$$v_{\text{esc}} = \sqrt{\frac{2GM}{R}}$$
$$v_{\text{orb}} = \sqrt{\frac{GM}{r}}$$
$$R_S = \frac{2GM}{c^2}$$
$$T = 1/f$$
$$\omega = 2\pi f$$
$$k = \frac{2\pi}{\lambda}$$
$$v = \lambda f$$
$$y(x,t) = A\cos\left(\frac{2\pi}{\lambda}x - \omega t\right)$$
$$f_n = n\frac{v}{2L} \quad \text{fixed string or open pipe}$$
$$f_n = n\frac{v}{4L} \quad \text{stopped pipe}$$
$$f_{\text{beat}} = f_a - f_b$$
$$f_L = \frac{v + v_L}{v + v_S} f_S$$