$$g = 9.80\,\frac{m}{s^2}$$

$$\bar{v} = \frac{x_2 - x_1}{t_2 - t_1} = \frac{\Delta x}{\Delta t}$$

$$\bar{a} = \frac{v_2 - v_1}{t_2 - t_1} = \frac{\Delta v}{\Delta t}$$

$$v = v_0 + at$$

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

$$v^2 = v_0^2 + 2a(x - x_0)$$

$$x - x_0 = \frac{1}{2}(v + v_0)t$$

$$x = x_0 + v_{x0}\,t$$

$$v_x = v_{x0}$$

$$y = y_0 + v_{y0}\,t - \frac{1}{2}gt^2$$

$$v_y = v_{y0} - gt$$

$$v_y^2 = v_{y0}^2 - 2g\,(y - y_0)$$

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

$$F_{fr} \leq \mu_s F_N$$

$$F_{fr} = \mu_k F_N$$

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

$$\vec{\mathbf{A}} = A_x\hat{\mathbf{i}} + A_y\hat{\mathbf{j}} + A_z\hat{\mathbf{k}}$$

$$A = \sqrt{A_x^2 + A_y^2 + A_z^2}$$

$$\vec{\mathbf{A}}\cdot\vec{\mathbf{B}} = AB\cos\theta = A_xB_x + A_yB_y + A_zB_z$$

$$W = \vec{\mathbf{F}}\cdot\vec{\mathbf{d}}$$

$$K = \frac{1}{2}mv^2$$

$$W_{net} = K_f - K_i$$

$$W_{nc} = \Delta PE + \Delta K$$

$$PE_g = mgh$$

$$PE_s = \frac{1}{2}kx^2$$

$$M\vec{\mathbf{r}}_{cm} = \sum_i m_i\vec{\mathbf{r}}_i$$

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

$$v'_B - v'_A = -(v_B - v_A)$$

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

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

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

$$\theta - \theta_0 = \frac{1}{2}(\omega + \omega_0)t$$

$$v_t = r\omega$$

$$a_t = r\alpha$$

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

$$I_{disc} = \frac{1}{2}MR^2$$

$$I_{sphere} = \frac{2}{5}MR^2$$

$$I_{ring} = MR^2$$

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

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

$$K_{rot} = \frac{1}{2}I\omega^2$$

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

$$L = I\omega$$

$$L_i = L_f$$

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

$$v(t) = -\omega A\sin(\omega t)$$

$$a(t) = -\omega^2 A\cos(\omega t)$$

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

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

$$f = \frac{1}{T}$$

$$T = 2\pi\sqrt{\frac{l}{g}}$$

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

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

$$v = \frac{\omega}{k}$$

$$v = \sqrt{\frac{F_T}{\mu}}$$

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

$$f_n = n\frac{v}{2L},\quad n\frac{v}{4L}$$

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

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

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

$$I = P_{avg}/Area$$

$$I = \frac{1}{2}\rho\omega^2A^2v$$

$$\Delta P_{max} = \rho\omega vA$$

$$v_{snd} = 343\,m/s$$

$$f' = f_0\left(\frac{v_{snd} \pm v_{obs}}{v_{snd} \mp v_{source}}\right)$$