$$a_T = r\,\alpha$$

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

$$A_y = A\ Sin\ \theta_A$$

$$a_{avg} = \bar{a} = \frac{\Delta v}{\Delta t} = = \frac{v_f - v_i}{t_f - t_i}$$

$$\vec{a} = \lim_{\Delta t \to 0} \frac{\Delta \vec{v}}{\Delta t}$$

$$\vec{a}_{avg} = \frac{\Delta \vec{v}}{\Delta t}$$

$$A_x = A\, Cos\theta_A$$

$$d\ Sin\theta_{dark} = (m + \tfrac{1}{2})\,\lambda$$

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

$$d\ Sin\theta_{bright} = m\,\lambda$$

$$2d\ Sin(\theta) = m\lambda$$

$$\Delta E \Delta t \geq \hbar/4\pi$$

$$d\ Sin(\theta_{bright}) = m\,\lambda$$

$$E_n = n\ h\ f$$

$$E_n = \frac{-m_e k_e^2 e^4}{2\hbar^2}\left(\frac{1}{n^2}\right)$$

$$f_o = f_s\left(\frac{v + v_o}{v - v_a}\right)$$

$$F_s = -kx$$

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

$$f_n = n\, f_1 = \frac{v}{4L}$$

$$f_b = |f_2 - f_1|$$

$$f_n = n\, f_1 = \frac{v}{2L}$$

$$f = \frac{m_e k_e^2 e^4}{4\pi\hbar^3}\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$$

$$f_n = n\, f_1 = \frac{n}{2L}\sqrt{\frac{F}{\mu}}$$

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

$$F_G = \frac{G\, m_1\, m_2}{r^2}$$

$$\vec{I} \equiv \vec{F}\ \Delta t = \Delta \vec{p}$$

$$I = P/A$$

$$(KE_T + KE_r + PE)_i = (KE_T + KE_r + PE)_f$$

$$I_i \omega_i = I_f \omega_f$$

$$KE \equiv \tfrac{1}{2} m v^2$$

$$I = \sum m\, r^2$$

$$\tfrac{1}{2} m v_i^2 + mgy_i = \tfrac{1}{2} m v_f^2 + mgy_f$$

$$KE_{max} = h\, f - \phi$$

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

$$r_2 - r_1 = n\lambda$$

$$m_1 \vec{v}_{1i} + m_2 \vec{v}_{2i} = m_1 \vec{v}_{1f} + m_2 \vec{v}_{2f}$$

$$PE_G = -G\frac{M_E m}{r}$$

$$\overline{P} = \frac{\Delta W}{\Delta t} = F\,\overline{v}$$

$$\Delta p \Delta x \geq \hbar/4\pi$$

$$PE_S \equiv \tfrac{1}{2} k x^2$$

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

$$\Delta \vec{r} = \vec{r}_f - \vec{r}_i$$

$$Sin(\theta_{dark}) = m\lambda/a$$

$$T = 2\pi\sqrt{\frac{m}{k}} = \frac{1}{\omega}$$

$$\bar{v} = \tfrac{1}{2}(v_o + v)$$

$$v_y = v_{oy} + a_y t$$

$$v_x = v_{ox} + a_x t$$

$$v = v_o + at$$

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

$$v^2 - v_o^2 = 2a\Delta x$$

$$v_x^{\ 2} - v_{ox}^2 = 2a_x \Delta x$$

$$v_y^{\ 2} - v_{oy}^2 = 2a_y \Delta y$$

$$v_{avg} = \bar{v} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$$

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

$$v = f\ \lambda$$

$$\vec{v}_{avg} = \frac{\Delta \vec{r}}{\Delta t}$$

$$v_T = r\omega$$

$$v = \pm\sqrt{\frac{k}{m}(A^2 - x^2)}$$

$$v = -\omega\, A\, Sin(\omega t)$$

$$\vec{v} = \lim_{\Delta t \to 0} \frac{\Delta \vec{r}}{\Delta t}$$

$$W_{NC} = (KE_f - KE_i) + (PE_f - PE_i)$$

$$W = F\ \Delta x\ Cos\,\theta$$

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

$$W_{net} = \Delta KE = KE_f - KE_i$$

$$\Delta x \equiv x_f - x_i$$

$$W_{NC} + W_C = \Delta KE$$

$$x = A\, Cos\,(wt)$$

$$\Delta x = v_o t + \tfrac{1}{2} a t^2$$

$$\alpha_{av} = \bar{\alpha} = \frac{\Delta \omega}{\Delta t} = \frac{\omega_f - \omega_i}{t_f - t_i}$$

$$\Delta x = v_{ox} t + \tfrac{1}{2} a_x t^2$$

$$\Delta y = v_{oy} t + \tfrac{1}{2} a_y t^2$$

$$y_{bright} = \frac{\lambda\, L}{d} m$$

$$\Delta\lambda = \lambda - \lambda_o = \frac{m}{m_o c}(1 - \cos(\theta))$$

$$\beta \equiv 10\log(I/I_o)$$

$$\lambda_{\min} = hc/eV$$

$$\sum \tau = I\,\alpha = \frac{\Delta L}{\Delta t}$$

$$\lambda_m\, T = 0.002898\ \ m \cdot K$$

$$\lambda = h/p = h/mv$$

$$\theta_A = \tan^{-1}(A_y/A_x)$$

$$\Delta\theta = \omega_i t + \tfrac{1}{2}\alpha\, t^2$$

$$\omega = \omega_i + \alpha t$$

$$\tau = r\, F\, Sin\theta_{rF}$$

$$\omega^2 = \omega_i^{\ 2} + 2\alpha\,\Delta\theta$$

$$\omega = 2\,\pi\, f = 2\pi/T = \sqrt{k/m}$$

$$\omega_{av} = \bar{\omega} = \frac{\Delta\theta}{\Delta t} = \frac{\theta_f - \theta_i}{t_f - t_i}$$