Quantum Mechanics

$$\hat{X} = \sqrt{\frac{\hbar}{2m\omega}}(a^\dagger + a)$$

$$\hat{P} = i\sqrt{\frac{m\hbar\omega}{2}}(a^\dagger - a)$$

$$a|n\rangle = \sqrt{n}|n-1\rangle$$

$$a^\dagger|n\rangle = \sqrt{n+1}|n+1\rangle$$

$$J_x = \frac{1}{2}(J_+ + J_-)$$

$$J_y = \frac{1}{2i}(J_+ - J_-)$$

$$J_\pm|j;m\rangle = \hbar\sqrt{j(j+1) - m(m\pm 1)}|j;m\pm 1\rangle$$

$$S_i = \frac{\hbar}{2}\sigma_i$$

$$[S_i;S_j] = i\hbar\epsilon_{ijk}S_k$$

$$< S_z >= \mathrm{Tr}[\rho S_z]$$

$$L^2|l;m\rangle = l(l+1)\hbar^2|l;m\rangle$$

$$L_z|l;m\rangle = m\hbar|l;m\rangle$$

$H =$ 1

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

$$v(t) = v_0 + at$$

$$v_f^2 - v_i^2 = 2a(x - x_0)$$

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

$$= \vec{r} \times \vec{F} = I\,\tilde{} = \frac{dL}{dt}$$

$$T = \frac{1}{2}mv^2 + \frac{1}{2}I\,!^2$$

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

$$f = \frac{!}{2}$$

$$L = I\,!$$

$$v_T = 2\ rf = !\,r$$

$$a_c = \frac{v^2}{r} = -m\tilde{} \times (\tilde{} \times \vec{r})$$

$$F_c = \frac{mv^2}{r}$$

$$F_{\text{cor}} = -2\tilde{} \times \vec{v}$$

$$W = \int d\ = \vec{F} \cdot \vec{s} = Fs\cos(\ )$$

$$P = \frac{dW}{dt}$$

$$U = mgh$$

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

$$U = -\frac{Gm_1M_2}{r^2}$$

$$I_{COM} = \int p(r)(\ _{jk}r^2 - (x_j - x_k))d^3r$$

$$I_{jk} = \sum_i m_i(\ _{jk}r_i^2 - (x_j x_k)_i)$$

$$I = I_{COM} + md^1 \qquad +$$

$$= k \, Z \, \frac{(\vec{r}^{0}) d^3 r^{0}}{j\vec{r} - \vec{r}^{0} j}$$

$$= \underset{lm}{X} [A_{lm} \left(\frac{r}{R}\right)^{l} + B_{lm} \left(\frac{r}{R}\right)^{-(1+l)}] Y_e^m (\;;\;)$$

$$E_{in} \frac{@}{@r} \;\; {}_{in} j_{r=R} - E_{out} \frac{@}{@r} \;\; {}_{out} j_{r=R} =$$

$$\vec{J} = \;\; \vec{E}$$

$$\vec{r} \cdot \vec{J} = -\frac{@}{@t}$$

$$\vec{J} = \vec{r} \times \vec{M}$$

$$\vec{K} = \vec{M} \times \hat{n} = \;\; \vec{v} = \;\; \vec{!} \times \vec{r}$$

$$B = \frac{0}{4} Z \frac{\vec{K} \times (-\vec{r})}{r^3} dS$$

$${}_B = Z \; \vec{B} \cdot d\vec{A} = I R$$

$$R = \frac{L^2}{V}$$

$$E = E_0 e^{i(kz - wt)}$$

$$E_1^{jj} = E_2^{jj}; \frac{1}{1} B_1^{jj} = \frac{1}{2} B_2^{jj}$$

$$\vec{r} \cdot \vec{B} = 0$$

$$\vec{r} \times \vec{B} = \;\; \vec{J} + \;\; \frac{@\vec{E}}{@t}$$

$$\vec{r} \cdot \vec{E} = \frac{free}{0}$$

$$\vec{r} \times \vec{E} = -\frac{@\vec{B}}{@t}$$

$$D = \;\; E; B = \;\; H$$

$$I \; \vec{D} \cdot d\vec{S} = Q$$

$$I \; \vec{B} \cdot d\vec{l} = \;\; I$$

$$\vec{r} \times \vec{H} \; \_ \; \left(\frac{i}{!} + \;\; 0 \;\; r\right) \frac{@E}{@t}$$

$$B = \frac{NI}{L}$$

$$V(t) = N \frac{d}{dt}$$

$$n_1 \sin(\;_1) = n_2 \sin(\;_2)$$

$$I = \frac{P}{A} = \frac{1}{2} v \; jEj^2$$

$$U_C = \frac{1}{2} C V^2$$

$$U_L = \frac{1}{2} L I^2 = \frac{1}{2} Z \; H \cdot B dr^3$$

$$\vec{F} = r(\vec{m} \cdot \vec{B})$$

$$\vec{B} = \frac{0}{4} \frac{3\hat{r}(\hat{r} \cdot \vec{m}) - \vec{m}}{r^3}$$