Classical Mechanics

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

$$E_{Total} = E_k + E_P$$

$$\boldsymbol{v} = \frac{d\boldsymbol{r}}{dt}$$

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

$$E = \frac{p^2}{2m} + V(x)$$

$$\frac{dx}{dt} = \left(\frac{2E_k}{m}\right)^{\frac{1}{2}}$$

$$x(t) = x(0) + m\left(\frac{2E_k}{m}\right)^{\frac{1}{2}}t$$

$$p(t) = mv(t) = m\frac{dx}{dt} = (2mE_K)^{\frac{1}{2}}$$

$$F = -\frac{dV}{dx}$$

$$\boldsymbol{F} = -\boldsymbol{\nabla}\mathbf{V}$$

$$\frac{dp}{dt} = m\frac{d^2x}{dt^2} = F$$

Rotational Motion

$$J = I\omega$$

$$I = mr^2$$

$$\frac{d\boldsymbol{J}}{dt} = \boldsymbol{T}$$

Waves

$$\lambda\nu = c$$

$$\tilde{\nu} = \frac{\nu}{c} = \frac{1}{\lambda}$$

Electrostatics

$$V = \frac{q_1 q_2}{4\pi\epsilon_0 r}$$

$$F = \frac{q_1 q_2}{4\pi\epsilon_0 r^2}$$

$$F = q_1 E$$

$$E = -\nabla\phi$$

$$P = I\Delta\phi$$

$$E = P\Delta t = I\Delta\phi\Delta t$$