EQUATIONS

$\vec{F}_{net} = m\vec{a}$

$v = \frac{dx}{dt}, \quad a = \frac{d^2x}{dt^2}$

$\theta = \frac{s}{r}$

$\omega = \frac{d\theta}{dt}$

$\alpha = \frac{d\omega}{dt}$

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

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

$\omega^2 = \omega_0^2 + 2\alpha\Delta\theta$

$v_t = r\omega$

$a_t = r\alpha, \quad a_r = r\omega^2$

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

$\tau = rF\sin\phi$

$\tau_{net} = I\alpha$

$I = \sum_i m_i r_i^2$

$I = I_{CM} + Md^2$

$\vec{L} = \vec{r} \times m\vec{v}$

$\frac{d\vec{L}}{dt} = \vec{\tau}_{net}$

$L = I\omega$

$U_g = Mgy_{cm}$

$K_{cm} = \frac{1}{2}Mv_{cm}^2$

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

$x(t) = A\cos(\omega t + \phi_0)$

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

$\tan\phi_0 = -\frac{v_0}{\omega x_0}$

$F_{sp} = -kx$

$\omega_{spring} = \sqrt{\frac{k}{m}},$

$\omega_{pendulum} = \sqrt{\frac{g}{L}}$

$E = \frac{1}{2}mv^2 + \frac{1}{2}kx^2 = \frac{1}{2}kA^2$

$y(x,t) = A\cos\left[kx \pm \omega t + \phi_0\right]$

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

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

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

$y(x,t) = A_{SW}\sin kx \sin \omega t$

$\frac{2\pi}{\lambda}\Delta x + \Delta\phi_0 = 2m\pi$

$\frac{2\pi}{\lambda}\Delta x + \Delta\phi_0 = 2\left(m + \frac{1}{2}\right)\pi$

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

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

$F = \frac{1}{4\pi\varepsilon_0}\frac{|q_1||q_2|}{r^2}$

$\vec{F} = q\vec{E}$

$E = \frac{1}{4\pi\varepsilon_o}\frac{q}{r^2}$

$E = \frac{\lambda}{2\pi\varepsilon_o r}$

$E = \frac{\sigma}{2\varepsilon_o}$

$\Phi_e = \vec{E} \cdot \vec{A}$

$\Phi_e = \int \vec{E} \cdot d\vec{A}$

$\Phi_e = \oint \vec{E} \cdot d\vec{A} = \frac{Q_{in}}{\varepsilon_0}$

$U = qV$

$U = \frac{1}{4\pi\varepsilon_o}\frac{q_1 q_2}{r}$

$V = Ed$

$V = \frac{1}{4\pi\varepsilon_o}\frac{q}{r}$

$V = \frac{1}{4\pi\varepsilon_o}\sum_{i=1}^{n}\left(\frac{q_i}{r_i}\right)$

$E = \frac{1}{4\pi\varepsilon_o}\frac{Q}{x\sqrt{a^2 + x^2}}$

$V = \frac{1}{4\pi\varepsilon_o}\int\frac{dq}{r}$

$V_f - V_i = -\int_i^f \vec{E} \cdot d\vec{s}$

$E_s = -\frac{dV}{ds}$

$C = \frac{Q}{V}$

$C = \frac{\varepsilon_0 A}{d}$

$C_{eq} = \sum_{i=1}^{n} C_i$

$\frac{1}{C_{eq}} = \sum_{i=1}^{n}\frac{1}{C_i}$

$U = \frac{1}{2}\frac{Q^2}{C} = \frac{1}{2}CV^2$

$I = \frac{dq}{dt}$

$J = \frac{I}{A}$

$J = \sigma E$

$\sigma = \frac{1}{\rho}$

$V = IR$

$R = \frac{\rho L}{A}$

$R_{eq} = \sum_{i=1}^{n} R_i$

$\frac{1}{R_{eq}} = \sum_{i=1}^{n}\frac{1}{R_i}$

$P = IV = \frac{V^2}{R} = I^2 R$

$\sum_i \Delta V_i = 0$

$\sum I_{in} = \sum I_{out}$