$$\vec{F} = \frac{k q_1 q_2}{r_{12}^2}\hat{r}_{12} = \frac{1}{4\pi\epsilon_0}\frac{q_1 q_2}{r_{12}^2}\hat{r}_{12}$$

$$\Phi_E = \oint \vec{E}\cdot d\vec{A}$$

$$\oint \vec{E}\cdot d\vec{A} = \frac{Q_{encl}}{\epsilon_0}$$

$$E_s = -dV/ds$$

$$V = W/q$$

$$V_{ptchg} = \frac{kq}{R}$$

$$\vec{E} = \int_{vol} \frac{k\,dQ}{r^2}\,dr\,\hat{r}$$

$$V = \int_{vol} \frac{k\,dQ}{r}$$

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

$$V = IR$$

$$E = E_0/K$$

$$C = KC_0$$

$$U_{cap} = \frac{1}{2}CV^2$$

$$Q = CV$$

$$Q = C\mathcal{E}(1 - e^{-t/RC})$$

$$Q = Q_0 e^{-t/RC}$$

$$C = \sum C_i \quad \text{Parallel}$$

$$\frac{1}{C} = \sum \frac{1}{C_i} \quad \text{Series}$$

$$R = \sum R_i \quad \text{Series}$$

$$\frac{1}{R} = \sum \frac{1}{R_i} \quad \text{Parallel}$$

$$\vec{F} = q\vec{v}\times\vec{B} = i\vec{L}\times\vec{B}$$

$$\vec{\mu} = n i \vec{A}$$

$$\vec{\tau} = \vec{\mu}\times\vec{B}$$

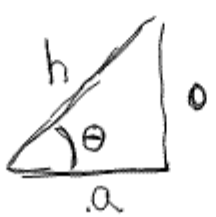
$$B_{solenoid} = \mu_0 n I$$

$$d\vec{B} = \frac{\mu_0}{4\pi}\frac{i\,d\vec{\ell}\times\hat{r}}{r^2}$$

$$\int_c \vec{B}\cdot d\vec{\ell} = \mu_0 I_{encl}$$

Sphere: $A = 4\pi r^2$, $V = \frac{4}{3}\pi r^3$

cylinder: $A = 2\pi rL + 2\pi r^2$, $V = \pi r^2 L$



$$\sin\theta = \frac{o}{h}$$

$$\cos\theta = a/h$$

$$\tan\theta = o/a$$

Const. Accel.

$$\begin{cases} v = v_0 + at \\ x = x_0 + v_0 t + \frac{1}{2}at^2 \\ v^2 = v_0^2 + 2a(x - x_0) \\ x^2 = x_0 + \frac{1}{2}(v_0 + v)t \end{cases}$$

$$a_c = \frac{mv^2}{R}$$

$$S = R\theta$$

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

$$PE_{spring} = \frac{1}{2}kx^2$$

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

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

$$\int u^n du = \frac{u^{n+1}}{n+1}$$

$$\int \frac{du}{u} = \ln|u|$$

$$\int e^u du = e^u$$

$$\int \frac{x\,dx}{\sqrt{x^2+a^2}} = \sqrt{x^2+a^2}$$

$$\mathcal{E} = -\frac{d\Phi_B}{dt}$$

$$\Phi_B = \int \vec{B} \cdot d\vec{A}$$

$$\mathcal{E}_1 = -L\frac{di_2}{dt}$$

$$\Phi_1 = L i_2$$

$$\mathcal{E}_1 = -M\frac{di_1}{dt}$$

$$\Phi_1 = M i_1$$

$$\mathcal{U}_m = B^2/2\mu_0$$

$$v = \lambda \nu$$

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

$$n = c/v$$

$$\frac{1}{i} + \frac{1}{o} = \frac{1}{f}$$

$$m = -\frac{i}{o}$$

$$d\sin\theta = m\lambda$$

$$\theta \sim 1.22\,\lambda/D$$