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

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

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

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

$$V = \frac{W}{q}$$

$$V_{\substack{Pt\\chg}} = \frac{kQ}{R}$$

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

$$U_E = \frac{\epsilon_0}{2}E^2$$

$$E_{\substack{\parallel plate\\cap}} = \frac{\sigma}{\epsilon_0}$$

$C = \sum C_i$ Parallel

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

$R = \sum R_i$ Series

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

$Q = CV$

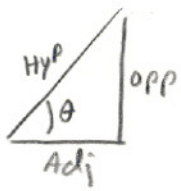
$$P = \frac{dU}{dt} = IV = I^2R = \frac{V^2}{R}$$

$E = E_0/K \quad C = KC_0$

$V = IR$

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

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



$\sin\theta = \frac{Opp}{Hyp}$

$\cos\theta = \frac{Adj}{Hyp}$

$\tan\theta = \frac{Opp}{Adj}$

Sphere

Area $= 4\pi r^2$

Volume $= \frac{4}{3}\pi r^3$

Cylinder

Area $= 2\pi rL + (2)\pi r^2$

Volume $= \pi r^2 L$

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

$$\vec{\mu} = NiA$$

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

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

$$B_{solenoid} = \mu_0 N i$$

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

$$\mathcal{E} = -\frac{d\Phi_B}{dt} = -\frac{d}{dt}\int \vec{B}\cdot d\vec{A}$$

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

$$\mathcal{E}_1 = -L\frac{dI_2}{dt} \qquad \Phi_1 = LI_2$$

$$\mathcal{E}_1 = -M\frac{dI_2}{dt} \qquad \Phi_1 = MI_1$$

$$U_M = B^2/2\mu_0$$

Integrals

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

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

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

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

Const Accel eqns

$$V = V_0 + at$$

$$x = x_0 + V_0 t + \frac{1}{2}at^2$$

$$V^2 = V_0^2 + 2(a)(x - x_0)$$

$$x = x_0 + \frac{1}{2}(V_0 + V)t$$