

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

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

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

$$E_S = -dv/ds$$

$$v = w/q$$

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

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

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

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

$$V = IR$$

$$E = E_0/\kappa$$

$$C = \kappa C_0$$

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

$$Q = CV$$

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

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

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

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

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

$$\vec{\mu} = ni \vec{A}$$

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

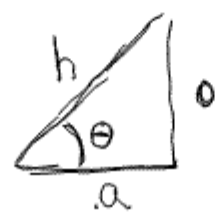
$$B_{solenoid} = \mu_0 n I$$

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

$$\oint_c \vec{B} \cdot d\vec{l} = \mu_0 I_{encl}$$

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

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



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

$$\cos \theta = \frac{a}{h}$$

$$\tan \theta = \frac{o}{a}$$

const. Accel. $\left\{ \begin{aligned} v &= v_0 + at \\ x &= x_0 + v_0 t + \frac{1}{2} at^2 \\ v^2 &= v_0^2 + 2a(x-x_0) \\ x^2 &= x_0 + \frac{1}{2}(v_0+v)t \end{aligned} \right.$

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

$$S = R\theta$$

$$KE = \frac{1}{2} m v^2$$

$$PE_{spring} = \frac{1}{2} k x^2$$

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

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

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

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

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

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