Phgn 361 1st lecture

Note Title 1/11/2006

$$\vec{F} = -\frac{G m M}{r^2}\hat{r}$$

$$2.0000 - -$$

$$\vec{F} = \frac{1}{4\pi\epsilon_0}\frac{qQ}{r^2}\hat{r}$$

charge proton = charge on electron
1 part in 10^{20}

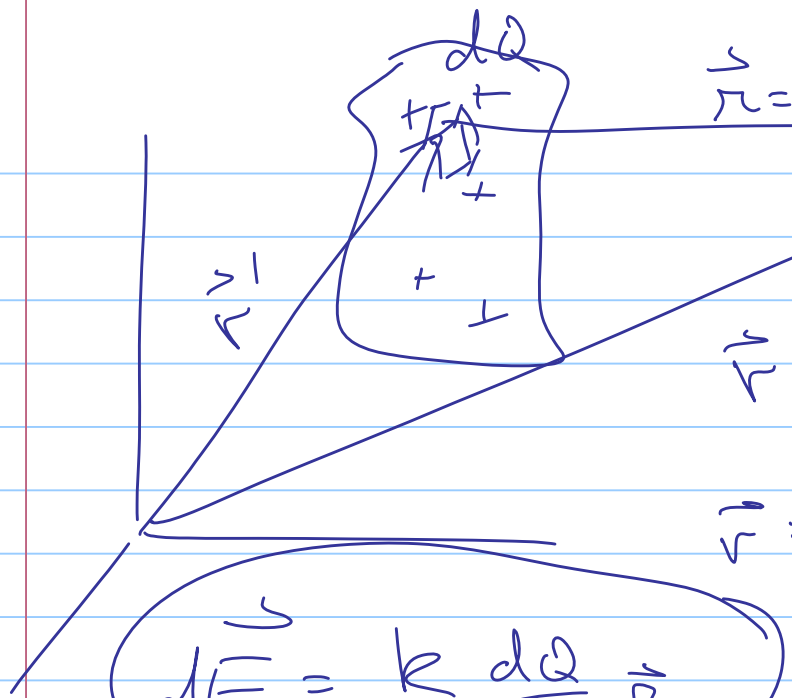
$$2 = 2 + \delta \qquad \delta \simeq 6 \times 10^{-16}$$

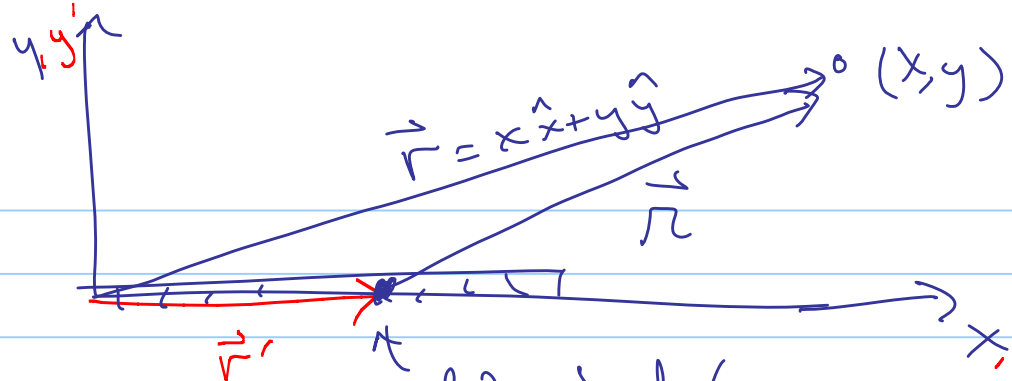
- obey superposition prin.

- charge is conserved

$p, \bar{p}, \bar{p}, p$

Model nature $F \propto (Q_1 + Q_2)^2$ not $Q_1 Q_2$


dQ
q
$\vec{r}$
$\vec{r}'$
$\vec{\imath} = \vec{r} - \vec{r}'$
$\hat{\imath} = \frac{\vec{\imath}}{|\vec{\imath}|}$
$k = \frac{1}{4\pi\epsilon_0}$
$\frac{1}{4\pi\epsilon_0} \frac{Qq}{|\vec{\imath}|^2} \hat{\imath} = \vec{F} = q\vec{E}$
$\vec{r} = x\hat{x} + y\hat{y} + z\hat{z}$
$d\vec{E} = k \frac{dQ}{\imath^3} \vec{\imath}$



uniform charge dist $\lambda \left(\frac{Coul}{m}\right)$

$dQ = \lambda dx'$

$\vec{r}' = x'\hat{x} + 0\hat{y}$

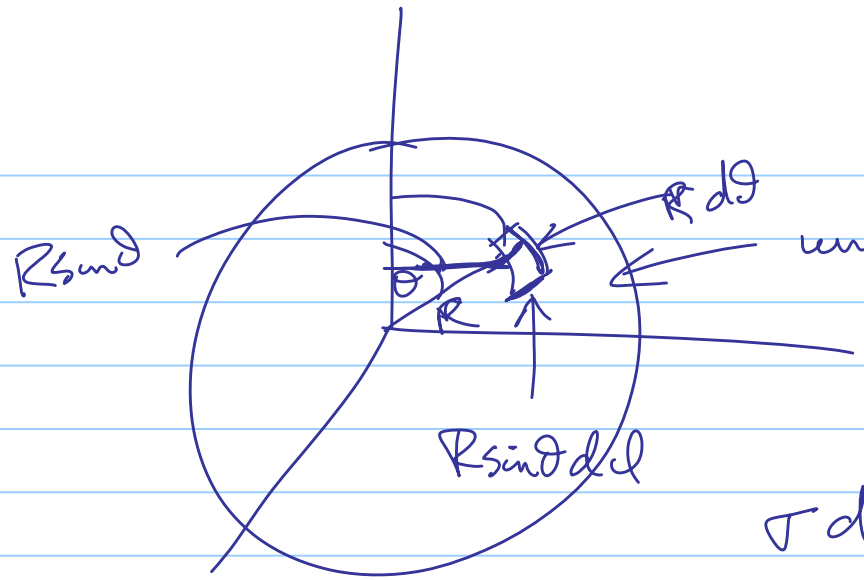
$\vec{\pi} = \vec{r} - \vec{r}' = (x\hat{x} + y\hat{y}) - x'\hat{x}$

$\vec{\pi} = (x - x')\hat{x} + y\hat{y}$

$|\vec{\pi}| = \sqrt{(x-x')^2 + y^2}$

$\hat{\pi} = \frac{\vec{\pi}}{|\vec{\pi}|}$

$$\int d\vec{E} = \int \frac{k\lambda dx' \vec{\pi}}{|\vec{\pi}|^3} = \int_0^L \frac{k\lambda dx' (x-x')\hat{x} + y\hat{y}}{\left[(x-x')^2 + y^2\right]^{3/2}}$$



uniformly distributed charge

$\sigma \frac{C}{m^2}$

$\sigma dA = \sigma R d\theta R \sin\theta d\varphi = dQ$