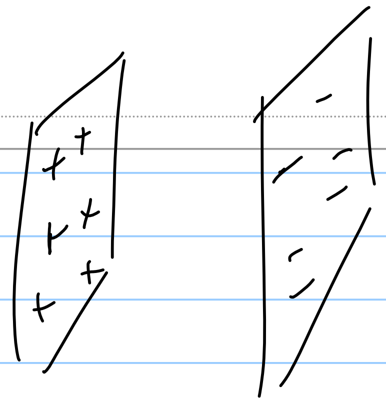
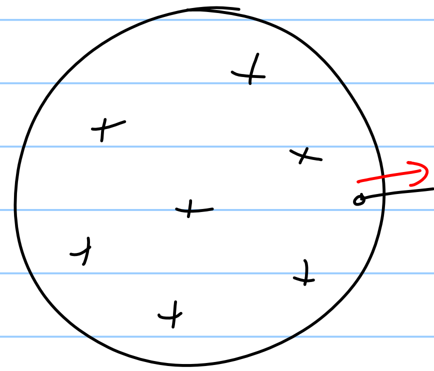
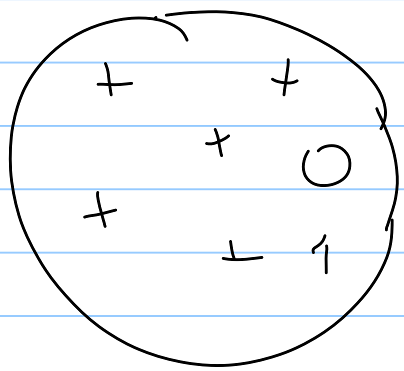
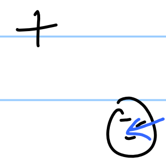
Note Title 1/12/2009

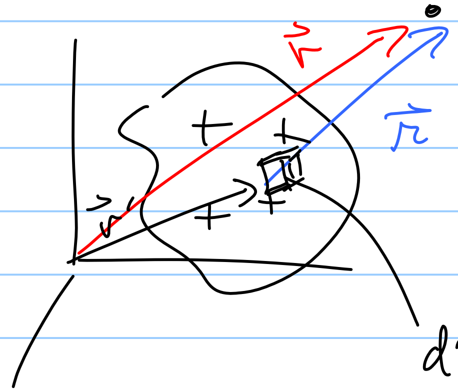




find E







$\cdot\, Q$ find $\vec F = Q\vec E$

know

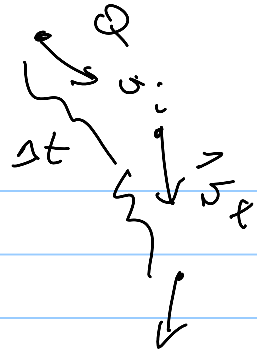
$$\vec E_{(x,y,z)} = \int \frac{k\rho(x',y',z')\,d\tau'}{|\vec r - \vec r'|^2}\frac{(\vec r - \vec r')}{|\vec r - \vec r'|}$$

$d\tau' = dx'dy'dz'$

$$\vec F = Q\int \frac{k\rho(x',y',z')\,dx'dy'dz'}{|\vec r - \vec r'|^2}\frac{(\vec r - \vec r')}{|\vec r - \vec r'|} = m\frac{d^2\vec r}{dt^2}$$

$$\vec F = m\frac{\Delta \vec v}{\Delta t}$$

find then solve for $\Delta\vec v = \vec v_f - \vec v_i$

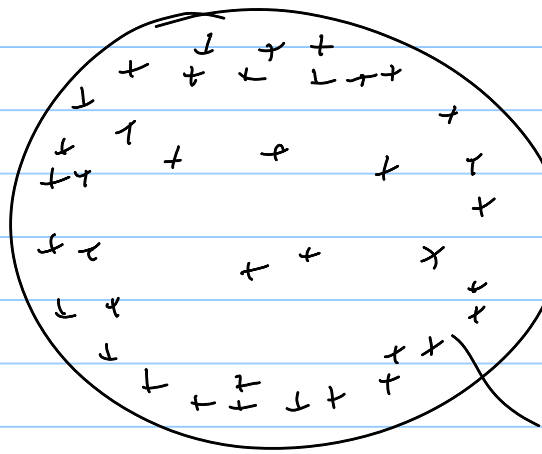


$\vec v_f - \vec v_i = \vec F \Delta t$

known

integrated to find

Other way to find $\vec E$ is by Gauss's Law



$\rho = \rho_0 r$

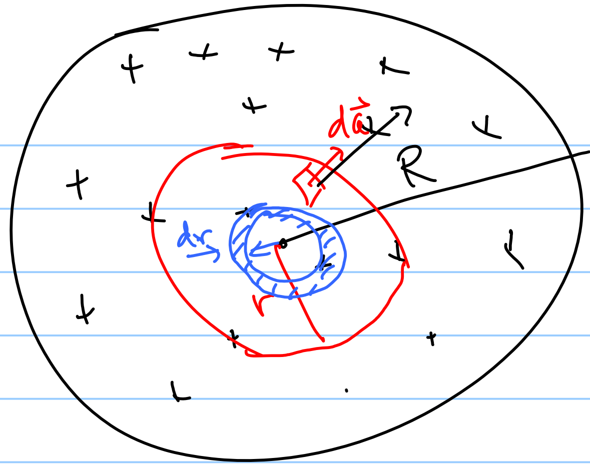
find $\vec E$ inside the sphere.

Problem solving strat.

- Fundamental princip.
  1. $\vec E = \int d\vec E = \int \frac{k\,dq}{r^2}\hat r$
  2. Gauss's law

- Outline soln.
  1. find $dq = \rho\, d\tau'$, $\vec r = \vec r - \vec r'$, limits
  2. use symmetry to find direction of $\vec E$, then choose Gaussian surface, find Qencl

- check limits: $r \to \infty$ E from pt. charge



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

$$\vec{E}\cdot d\vec{a} = |\vec{E}||d\vec{a}|\cos\phi$$

$$\int \vec{E}\cdot d\vec{a} = \int |\vec{E}||d\vec{a}|$$

$$= E\underbrace{\oint |d\vec{a}|}_{4\pi r^2} = E\,4\pi r^2$$

$$Q_{encl} = \int \rho(r)\, d\tau$$

$$d\tau = 4\pi r^2 dr$$

$$\int_0^R 4\pi r^2 dr = \frac{4}{3}\pi R^3$$

$$Q_{encl} = \int_0^r \rho_0 r' 4\pi r'^2 dr'$$

Gauss's

$$E\,4\pi r^2 = \frac{Q_{encl}}{\epsilon_0}$$ solve for E