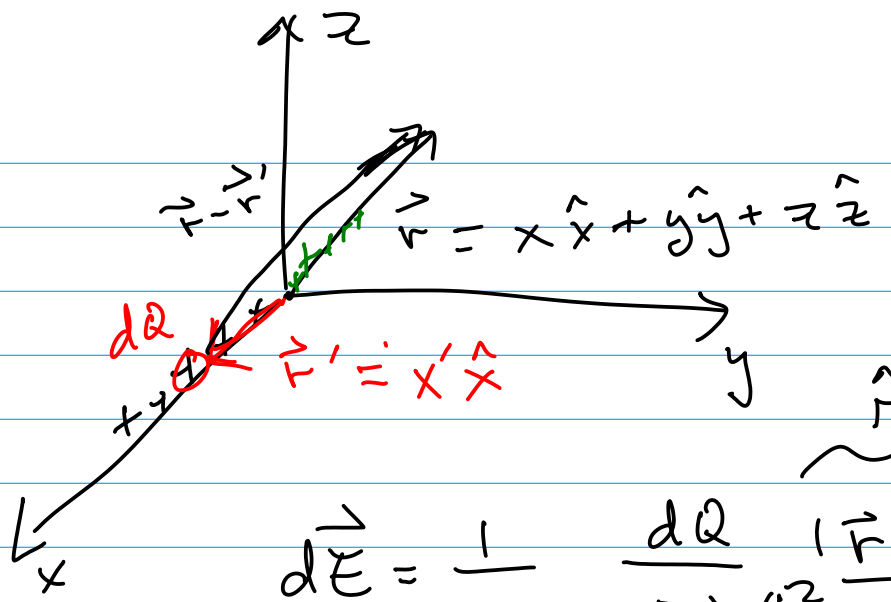
Review:



$$d\vec{E} = \frac{1}{4\pi\epsilon_0}\frac{dQ}{|\vec{r}-\vec{r}'|^2}\underbrace{\frac{(\vec{r}-\vec{r}')}{|\vec{r}-\vec{r}'|}}_{\hat{r}}$$

$$dQ = \lambda\, dx'$$

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

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

$$\vec{E} = \int_0^L \frac{\lambda\, dx'}{4\pi\epsilon_0}\frac{\left[(x-x')\hat{x} + y\hat{y} + z\hat{z}\right]}{\left[(x-x')^2 + y^2 + z^2\right]^{3/2}}$$

What questions do you have about this result?

As $\vec{r} \to \infty$ $\quad \vec{E} \to \frac{1}{4\pi\epsilon_0} \frac{Q_{tot}}{r^2} \hat{r}$

$x \gg x'$

$$\vec{E} = \int_0^L \frac{\lambda\, dx' \left[(x - x')\hat{x} + y\hat{y} + z\hat{z} \right]}{4\pi\epsilon_0 \left[(x - x')^2 + y^2 + z^2 \right]^{3/2}}$$

$$\vec{E} = \int_0^L \frac{\lambda\, dx' \left[x\left(1 - \frac{x'}{x}\right)\hat{x} + y\hat{y} + z\hat{z} \right]}{4\pi\epsilon_0 \left[x\left(1 - \frac{x'}{x}\right)^2 + y^2 + z^2 \right]^{3/2}}$$

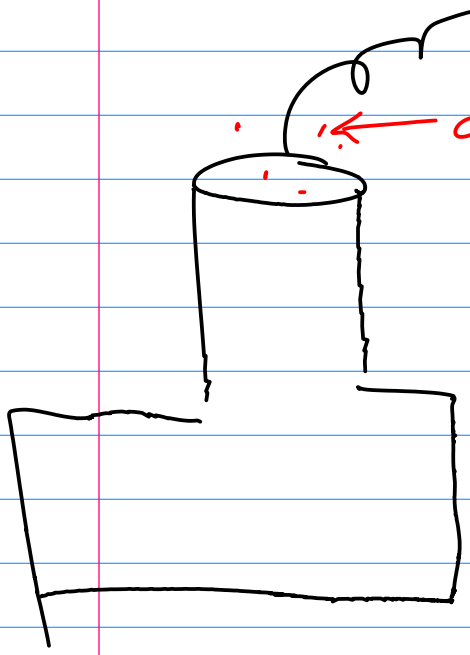
$$\vec{E} = \int_0^L \frac{\lambda\, dx' \left[x\hat{x} + y\hat{y} + z\hat{z} \right]}{4\pi\epsilon_0 \left[x^2 + y^2 + z^2 \right]^{3/2}}$$

$$= \int_0^L \frac{\lambda dx'}{4\pi\epsilon_0} \frac{\vec{r}}{|\vec{r}|} \frac{1}{r^2} = \frac{1}{4\pi\epsilon_0} Q_{tot} \frac{\hat{r}}{r^2}$$

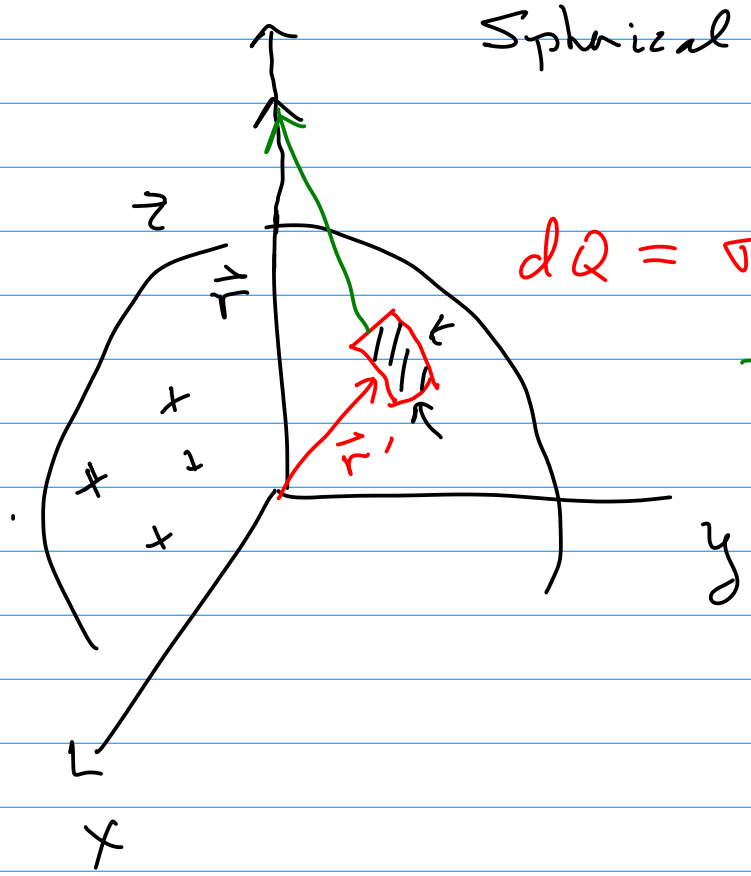
email questions → practice professional writing
→ writing to learn

http://wac.colostate.edu/intro/pop2d.cfm

http://en.wikipedia.org/wiki/Writing_Across_the_Curriculum



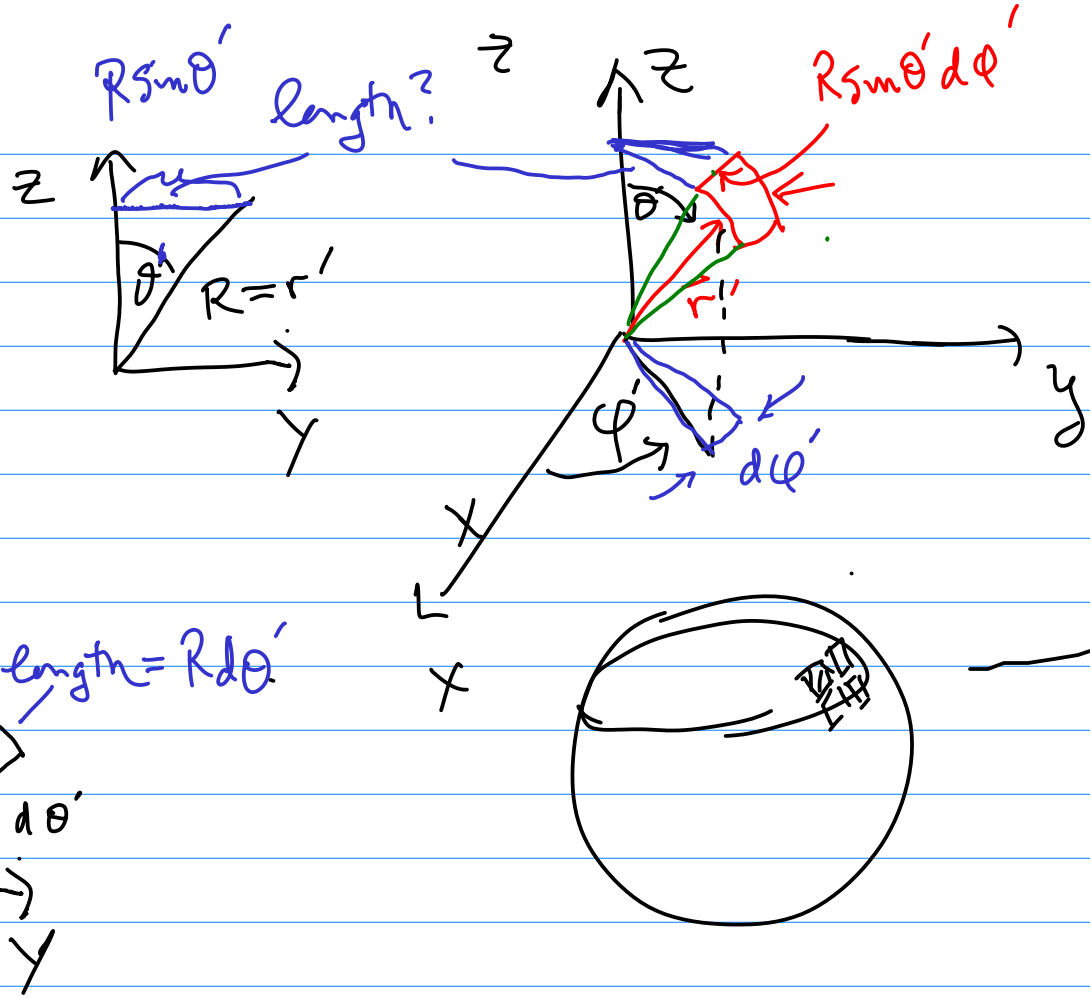
Spherical shell charged uniformly

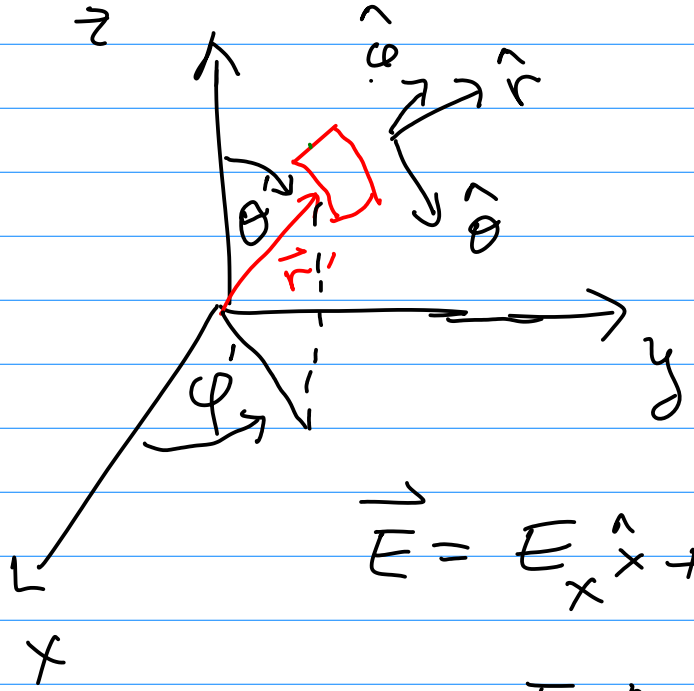


Coulombs/m²

$dQ = \sigma\, da'$

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

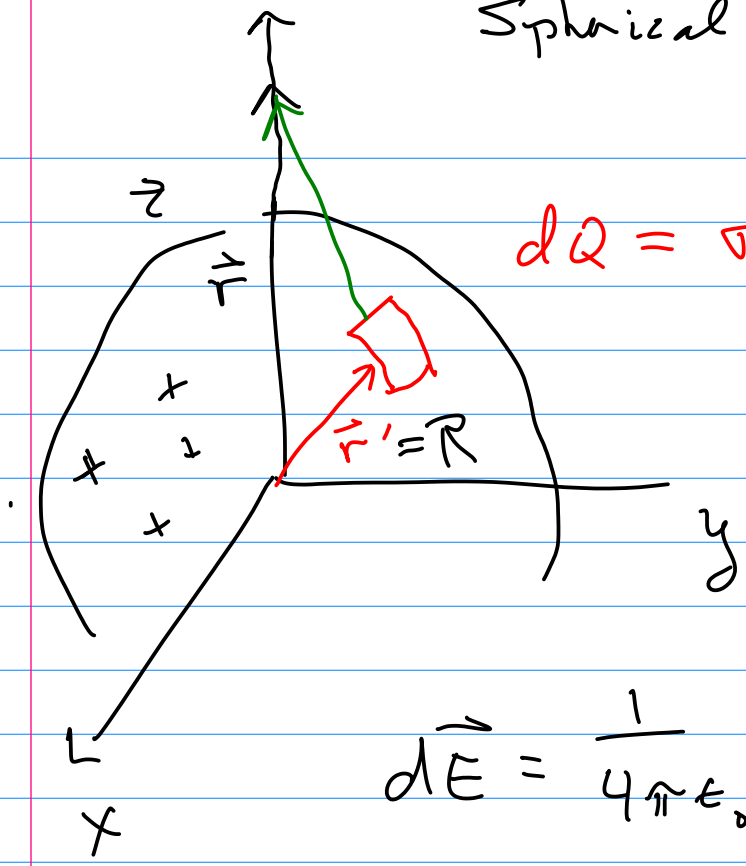




$$\vec{E} = E_x \hat{x} + E_y \hat{y} + E_z \hat{z}$$

$$= E_r \hat{r} + E_\theta \hat{\theta} + E_\varphi \hat{\varphi}$$

Spherical shell charged uniformly



Coulombs/m^2

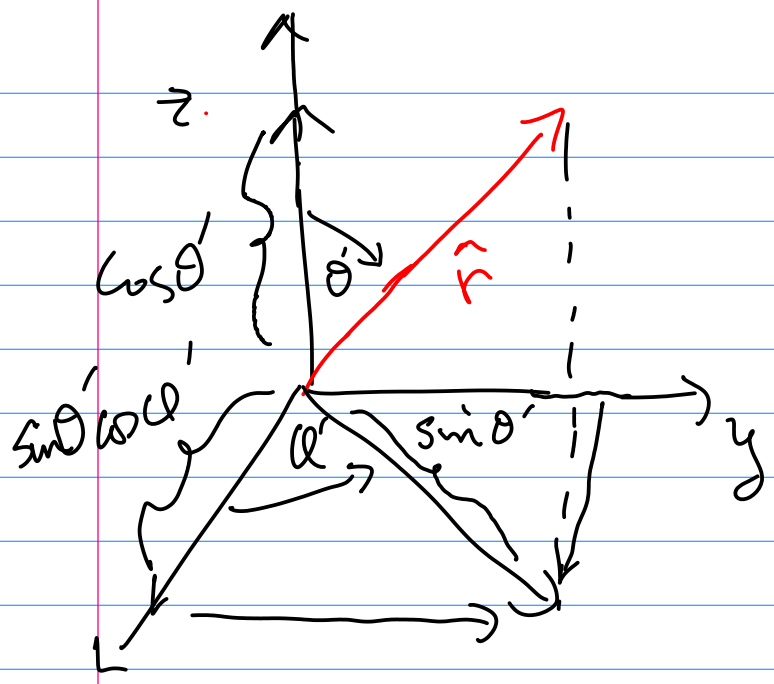
$dQ = \sigma \, da'$

$\vec{dE} = k \frac{dQ}{\mathcal{R}^2} \hat{\mathcal{R}}$ $\quad \hat{r} = \hat{r}'$

$\hat{\mathcal{R}}$

$\vec{dE} = \frac{1}{4\pi\epsilon_0} \frac{? \, d\theta' d\varphi'}{|R\hat{r} - z\hat{z}|^2} \frac{(R'\hat{r} + z\hat{z})}{|r'\hat{r} - z\hat{z}|}$

Questions:



$$\hat{r} = \sin\theta'\cos\phi'\,\hat{x} + \sin\theta'\sin\phi'\,\hat{y} + \cos\theta'\,\hat{z}$$

$$\vec{r} - \vec{r}\,' = z\hat{z} - \underbrace{\left(R\left[\sin\theta'\cos\phi'\hat{x} + \sin\theta'\sin\phi'\hat{y} + \cos\theta'\hat{z}\right]\right)}_{\vec{r}\,'}$$