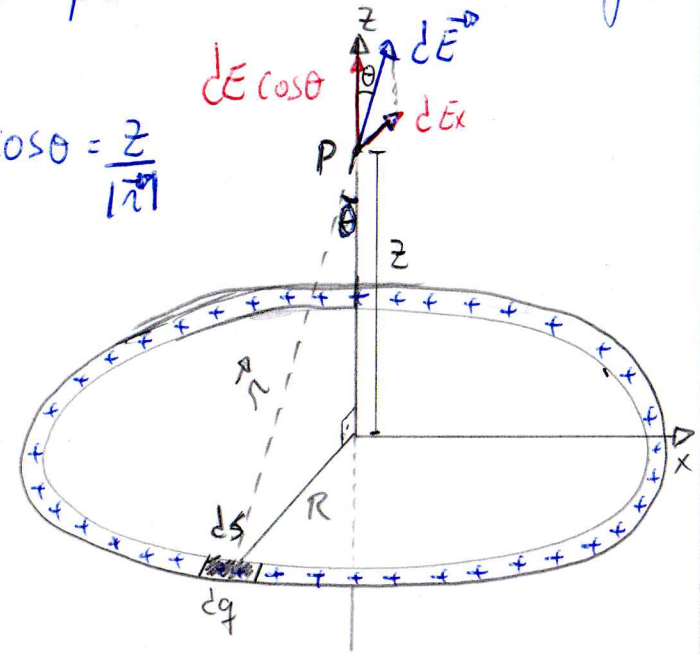
Campo em um anel carregado



$\cos\theta = \frac{z}{|\vec{r}|}$

$dq = \lambda\, ds$ → elemento de arco do anel

$\cos\theta = \frac{z}{r} = \frac{z}{\sqrt{z^2+R^2}}$

$dE = \frac{1}{4\pi\varepsilon_0}\cdot\frac{dq}{r^2}$

$dE = \frac{1}{4\pi\varepsilon_0}\cdot\frac{\lambda\, ds}{z^2+R^2}$

$|\vec{E}| = E = \int_0^{2\pi R} dE\cos\theta$

$E = \int_0^{2\pi R} \frac{1}{4\pi\varepsilon_0}\cdot\frac{\lambda\, ds}{z^2+R^2}\cdot\frac{z}{\sqrt{z^2+R^2}}$

$E = \frac{1}{4\pi\varepsilon_0}\cdot\frac{\lambda\cdot z}{(z^2+R^2)^{3/2}}\int_0^{2\pi R} ds$

$E = \frac{1}{4\pi\varepsilon_0}\cdot\frac{z\cdot\lambda}{(z^2+R^2)^{3/2}}\cdot 2\pi R$

$q = \lambda\cdot 2\pi R$

$E = \frac{1}{4\pi\varepsilon_0}\cdot\frac{z\cdot q}{(z^2+R^2)^{3/2}}$

Para $z \gg R \Rightarrow z^2+R^2 \to z^2$

$\therefore E = \frac{1}{4\pi\varepsilon_0}\frac{q\cdot z}{(z^2)^{3/2}}$

$E = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q}{z^2}$

→ carga pontual