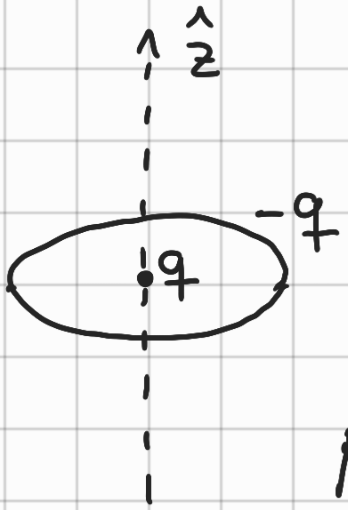

a) Momento monopolar $\sim Q_{TOTAL}$

$\Rightarrow Q_{TOTAL} = q - q = 0$

No hay momento monopolar

Momento dipolar $\Rightarrow$ veamos $\vec{p}$

(No depende porque $Q_{TOTAL} = 0$)

$$\vec{p} = \int_0^{2\pi} \lambda (R\cdot\cos\theta, R\,\text{sen}\theta, 0)\cdot R\,d\theta + (-q)\cdot\vec{0}$$

donde $\lambda = \dfrac{-q}{2\pi\cdot R}$

$$\Rightarrow \int_0^{2\pi} \cos\theta\, d\theta = 0 \quad // \quad \int_0^{2\pi} \text{sen}\theta\, d\theta = 0$$

$$\Rightarrow \boxed{\vec{p} = 0}$$ No hay momento dipolar

b) Calculo el potencial

$$V(0,0,z) = \overbrace{\frac{K\cdot q}{|z|}}^{\text{carga } q \text{ en el centro}} + \underbrace{K\cdot\lambda \int_0^{2\pi} \frac{R}{(R^2+z^2)^{1/2}}\, d\theta}_{\text{Anillo}}$$

Recordar: $V(\vec{r}) = \displaystyle\int \frac{\lambda(\vec{r}\,')}{|\vec{r}-\vec{r}\,'|}\, d\vec{\ell}$

$$\boxed{V(0,0,z) = \frac{K\cdot q}{|z|} - \frac{K\cdot q}{(R^2+z^2)^{1/2}}}$$

Si hago expansión multipolar...

$$V(0,0,z) = \frac{K\cdot q}{|z|} - \frac{K\cdot q}{|z|}\cdot\frac{1}{(1+R^2/z^2)^{1/2}}$$

$\rightsquigarrow$ Exp. de Taylor : $(1+R^2/z^2)^{1/2} \sim 1 - \frac{R^2}{2z^2}$

$$V(0,0,z) = \cancel{\frac{K\cdot q}{|z|}} - \cancel{\frac{K\cdot q}{|z|}} + \frac{K\cdot q}{|z|}\cdot\frac{R^2}{z^2} \longleftarrow$$

$$\Rightarrow \boxed{V(0,0,z) = \frac{K\cdot q\cdot R^2}{2|z|^3}}$$

$\to$ No es dipolar, no se escribe como $\frac{\vec{p}\cdot\bar{r}}{|\bar{r}|^3}$

$$\boxed{\vec{E}(z) = \frac{K\cdot q\cdot R^2}{2}\cdot\frac{3\,sg(z)}{|z|^4}\,\hat{z}}$$