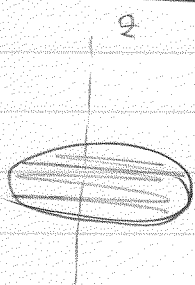


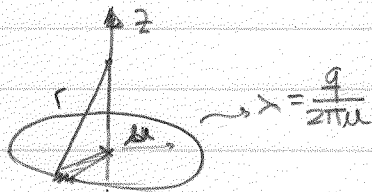
# EJERCICIO 1

a)



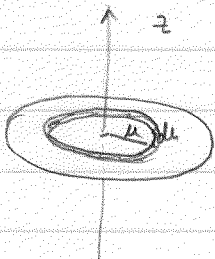
$$V(z) = ?$$

PRIMERO CALCULAMOS POTENCIAL DE 1 ARO CON CARGA q Y RADIO u:



$$dV = \frac{dq}{4\pi\epsilon_0 r} = \frac{q \cdot d\theta}{4\pi\epsilon_0 \cdot 2\pi \sqrt{z^2 + u^2}} \Rightarrow V(z) = \int_0^{2\pi} dV = \frac{q}{4\pi\epsilon_0 \sqrt{z^2 + u^2}}$$

Ahora consideramos el disco como la superposición de muchos aros.



$$dV = \frac{dq}{4\pi\epsilon_0 \sqrt{z^2 + u^2}}$$

$$dq = \sigma \cdot 2\pi u \cdot du$$

$$V = \int_0^R \frac{\sigma \cdot 2\pi u \cdot du}{4\pi\epsilon_0 \sqrt{z^2 + u^2}} = \frac{\sigma}{2\epsilon_0} \int_0^R \frac{u \cdot du}{\sqrt{z^2 + u^2}} = \frac{\sigma}{2\epsilon_0} \left[ \sqrt{z^2 + R^2} - |z| \right] = V(z)$$

$\frac{dV}{du} = \frac{u}{\sqrt{z^2 + u^2}} \Rightarrow \frac{dV}{du} = \frac{u}{\sqrt{z^2 + u^2}} \Rightarrow \frac{dV}{du} = \frac{u}{\sqrt{z^2 + u^2}}$

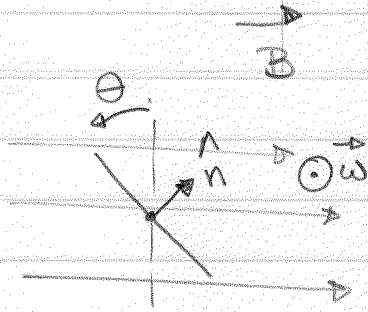
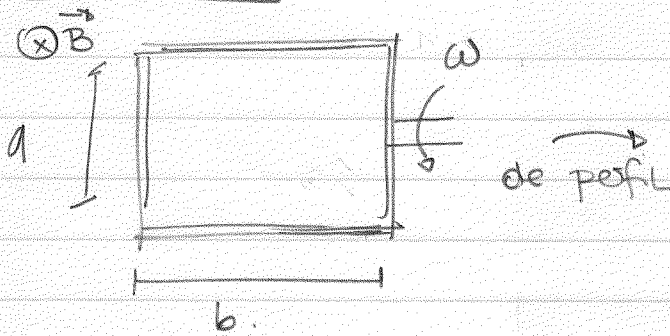
b) Por simetría,  $\vec{E}_{\text{gr}} = E(z) \hat{z} = -\frac{\partial V}{\partial z} \hat{z} = -\frac{\sigma}{2\epsilon_0} \left[ \frac{z}{\sqrt{z^2 + R^2}} - \text{sgn}(z) \right] \hat{z}$

c)  $\vec{F} = \int dq \vec{E} = \int_0^L \lambda dz E(z) \hat{k} = \lambda \int_0^L -\frac{\partial V}{\partial z} dz \hat{k}$

$$\Rightarrow \vec{F} = -\frac{\lambda \sigma}{2\epsilon_0} \left[ \sqrt{L^2 + R^2} - L - R \right] \hat{k}$$

OBS:  $\sqrt{L^2 + R^2} - L - R < 0 \Rightarrow F > 0 \checkmark$

## EJERCICIO 2



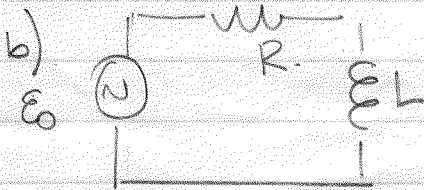
$$a) \quad \mathcal{E}_{ind} = - \frac{d\phi}{dt} = -N \cdot \frac{d\phi}{dt}$$

$$\phi = \int_{SUP} \vec{B} \cdot d\vec{A} = \int_{SUP} B \cdot \cos\theta \, dA = B \cdot \cos\theta \cdot \int_{S} dA = B \cos\theta \, ab$$

$\vec{B}$  ou force

$$\boxed{\mathcal{E}_{ind} = \underbrace{NBab}_{\mathcal{E}_0} \cdot \omega \sin(\omega t)}$$

$\theta = \omega t$



OBS → Dado que nos piden  $V_{R_{rms}}$  no nos importa la fase de  $\mathcal{E}(t)$ .

$$\hat{I} = \frac{\mathcal{E}_0}{R + j\omega L} \Rightarrow \hat{V}_R = R \cdot \frac{\mathcal{E}_0}{R + j\omega L}$$

$$V_{R_{rms}} = \frac{1}{\sqrt{2}} \cdot |\hat{V}_R| = \frac{R}{\sqrt{2(R^2 + \omega^2 L^2)}} \cdot NBab\omega = V_{R_{rms}}$$

$$c) \quad P_{media} = \frac{V_{R_{rms}}^2}{R} = \frac{R}{2(R^2 + \omega^2 L^2)} \cdot (NBab\omega)^2 = P_0$$

$$R \cdot (NBab)^2 \omega^2 = P_0 \cdot 2(R^2 + \omega^2 L^2)$$

$$\omega^2 [R(NabB)^2 - 2P_0 L^2] = 2P_0 R^2$$

$$\omega = \sqrt{\frac{2P_0 R^2}{R(NabB)^2 - 2P_0 L^2}} = 315 \text{ rad/s}$$

