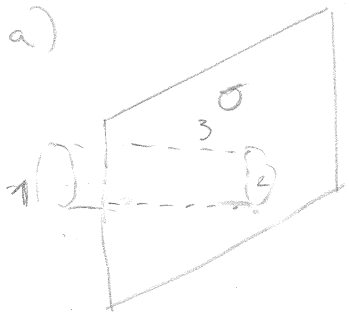
E; 1

a)



$$\oint \vec{E} \cdot d\vec{A} = \frac{q_0}{\varepsilon_0} = \frac{\sigma \cdot \pi R^2}{\varepsilon_0}$$

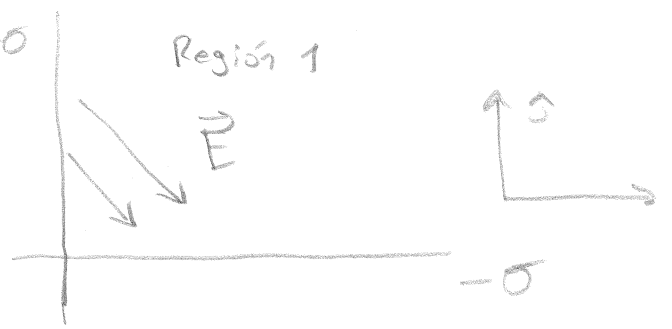
$$\oint \vec{E} \cdot d\vec{A} = \Phi_1 + \Phi_2 + \Phi_3$$

$\Phi_2 = 0$ (campo $\perp$ a $d\vec{A}$)

$$\Phi_1 = \Phi_3 = E \cdot \pi R^2$$

$$\Rightarrow \boxed{E = \frac{\sigma}{2\varepsilon_0}}$$

b)



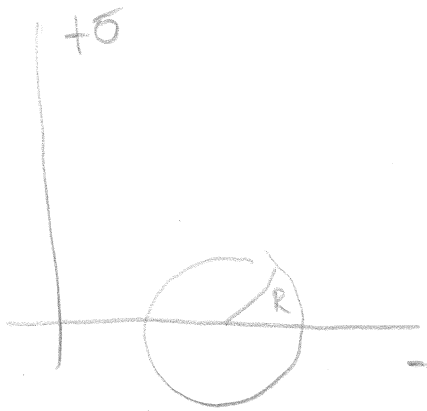
En la región 1

$$\vec{E}_{\sigma+} = \frac{\sigma}{2\varepsilon_0}\,\hat{\jmath} \qquad \vec{E}_{\sigma-} = \frac{-\sigma}{2\varepsilon_0}\,\hat{\jmath}$$

$$\boxed{\vec{E} = \frac{\sigma}{2\varepsilon_0}(\hat{\jmath} - \hat{\jmath})}$$

$$|\vec{E}| = \frac{\sigma}{2\varepsilon_0}\sqrt{2} = \frac{\sigma}{\sqrt{2}\,\varepsilon_0}$$

c)



$$\Phi = \oint \vec{E} \cdot d\vec{A} = \frac{q_0}{\varepsilon_0} = \boxed{\frac{-\sigma \cdot \pi R^2}{\varepsilon_0} = \Phi}$$