a) $\underline{0<r<r_1}$: condutor $\Rightarrow \vec{E}=0=\vec{D}=\vec{P}$

$\underline{r_1<r<r_2}$. Superfície cilíndrica de Gauss de altura h

$$\int_S (\vec{D}\cdot\vec{n})\,dS = \lambda h$$

$$|\vec{D}|\,2\pi r h = \lambda h$$

$$\boxed{\vec{D}=\frac{\lambda}{2\pi}\frac{1}{r}\vec{e}_r} \; ; \; \boxed{\vec{E}=\frac{\lambda}{2\pi\varepsilon}\frac{1}{r}\vec{e}_r}$$

$$\boxed{\vec{P}=\frac{\varepsilon-\varepsilon_0}{\varepsilon}\frac{\lambda}{2\pi}\frac{1}{r}\vec{e}_r}$$

$\underline{r>r_2}$ $\quad \boxed{\vec{D}=\frac{\lambda}{2\pi}\frac{1}{r}\vec{e}_r}\; ; \;\boxed{\vec{E}=\frac{\lambda}{2\pi\varepsilon_0}\frac{1}{r}\vec{e}_r}\; ; \; \vec{P}=0$

b) $\sigma'(r_1) = -\frac{\varepsilon-\varepsilon_0}{\varepsilon}\frac{\lambda}{2\pi}\frac{1}{r_1} < 0 \quad (\vec{n}=-\vec{e}_r)$

$\sigma'(r_2) = +\frac{\varepsilon-\varepsilon_0}{\varepsilon}\frac{\lambda}{2\pi}\frac{1}{r_2} > 0 \quad (\vec{n}=+\vec{e}_r)$

c) $\underline{0<r<r_1}$ $\quad \phi=0$ (condutor é uma equipotencial)

$\underline{r_1<r<r_2}$

$$0-\phi(r) = \int_{r_1}^{r}\vec{E}\cdot d\vec{r} = \frac{\lambda}{2\pi\varepsilon}\left(\ln r - \ln r_1\right)$$

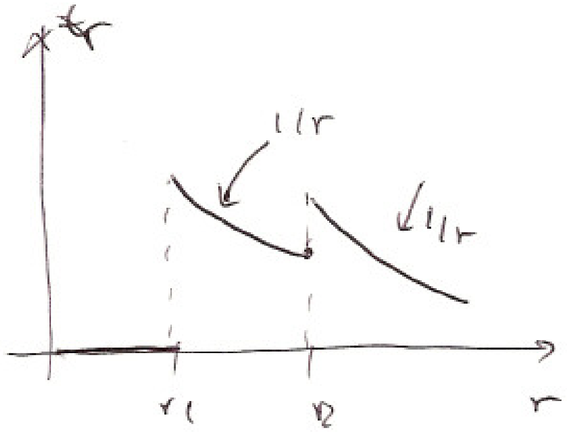
$$\boxed{\phi(r) = -\frac{\lambda}{2\pi\varepsilon}\ln\frac{r}{r_1}}$$

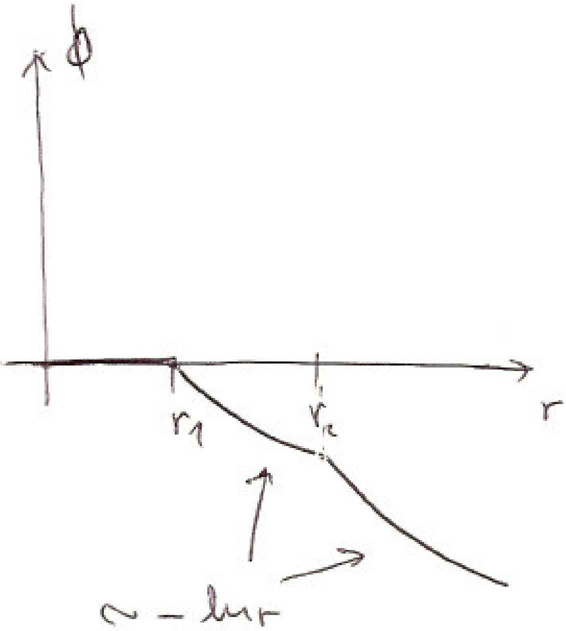
$\underline{r > r_2}$

$$\Phi(r_2) - \Phi(r) = \int_{r_2}^{r} \vec{E} \cdot d\vec{r} = \frac{\lambda}{2\pi\varepsilon_0} \ln\left(\frac{r}{r_2}\right)$$

$$\boxed{\Phi(r) = -\frac{\lambda}{2\pi\varepsilon} \ln\left(\frac{r_2}{r_1}\right) - \frac{\lambda}{2\pi\varepsilon_0} \ln\left(\frac{r}{r_2}\right)}$$

d)





1º Teste TEO – Versão H (3/11/2006)

Parecida com a versão D. Soluções

a) $0<r<r_1$

$$\vec{D} = \frac{\lambda}{2\pi}\frac{1}{r}\vec{e}_r \; ; \; \vec{E} = \frac{\lambda}{2\pi\varepsilon_0}\frac{1}{r}\vec{e}_r \; ; \; \vec{P} = 0$$

$r_1<r<r_2$

$$\vec{D} = \frac{\lambda}{2\pi}\frac{1}{r}\vec{e}_r \; ; \; \vec{E} = \frac{\lambda}{2\pi\varepsilon}\frac{1}{r}\vec{e}_r \; ; \; \vec{P} = \frac{\varepsilon-\varepsilon_0}{\varepsilon}\frac{\lambda}{2\pi}\frac{1}{r}\vec{e}_r$$

$r>r_2$

$$\vec{D} = \frac{\lambda}{2\pi}\frac{1}{r}\vec{e}_r \; ; \; \vec{E} = \frac{\lambda}{2\pi\varepsilon_0}\frac{1}{r}\vec{e}_r \; ; \; \vec{P} = 0$$

b) $\boxed{\sigma'(r_1) = -\frac{\varepsilon-\varepsilon_0}{\varepsilon}\frac{\lambda}{2\pi}\frac{1}{r_1}}$; $\boxed{\sigma'(r_2) = \frac{\varepsilon-\varepsilon_0}{\varepsilon}\frac{\lambda}{2\pi}\frac{1}{r_2}}$

c) $0<r<r_1$ $\quad \phi(r) = \frac{\lambda}{2\pi\varepsilon_0}\ln\left(\frac{r_1}{r}\right)$

$r_1<r<r_2$ $\quad \phi(r) = -\frac{\lambda}{2\pi\varepsilon}\ln\left(\frac{r}{r_1}\right)$

$r_2<r$ $\quad \phi(r) = -\frac{\lambda}{2\pi\varepsilon}\ln\left(\frac{r_2}{r_1}\right) - \frac{\lambda}{2\pi\varepsilon_0}\ln\left(\frac{r}{r_2}\right)$