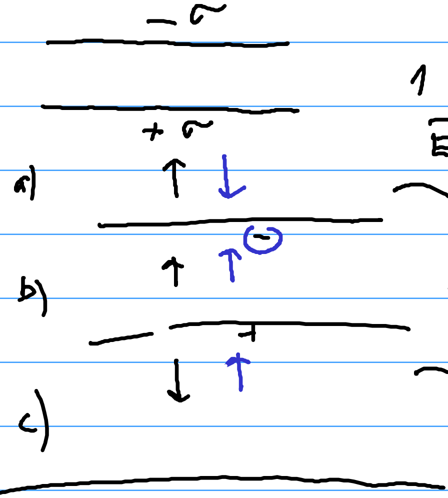
Pole kondenzátoru



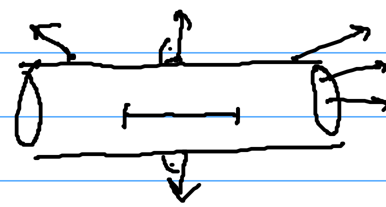
1 deska (∞)

$$\vec{E} = \pm \frac{\sigma}{2\varepsilon_0}\hat{z}$$

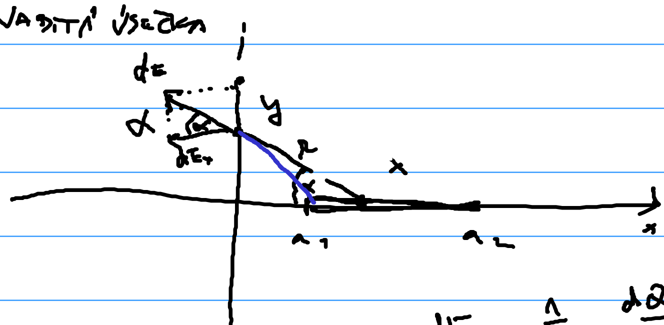
a) $\longrightarrow E = 0$

b) $\longrightarrow E = \frac{\sigma}{\varepsilon_0} = \frac{Q}{\varepsilon_0 S}$

c) $\longrightarrow E = 0$



Nabitá úsečka



$$dE = \frac{1}{4\pi\varepsilon}\frac{dQ}{r^2} = \frac{1}{4\pi\varepsilon_0}\frac{\lambda dx}{r^2} = \frac{1}{4\pi\varepsilon_0}\frac{\lambda dx}{y^2+x^2}$$

$dE_x =$

$$\cos\alpha = \frac{dE_x}{dE} \qquad dE_x = dE\cdot\frac{x}{\sqrt{x^2+y^2}}$$

$$dE_y = dE\cdot\frac{y}{\sqrt{x^2+y^2}}$$

$$E_x = \int_{a_1}^{a_2}\frac{1}{4\pi\varepsilon_0}\cdot\frac{\lambda dx}{y^2+x^2}\cdot\frac{x}{\sqrt{x^2+y^2}} = \frac{\lambda}{4\pi\varepsilon_0}\int_{a_1}^{a_2}\frac{x\,dx}{(x^2+y^2)^{3/2}}$$

$$\left[t = x^2+y^2 \qquad dt = 2x\,dx\right] \qquad = \frac{\lambda}{8\pi\varepsilon_0}\int_{a_1^2+y^2}^{a_2^2+y^2}\frac{dt}{t^{3/2}}$$

$$= \frac{\lambda}{8\pi\varepsilon_0}\left[-2t^{-\frac{1}{2}}\right]_{a_1^2+y^2}^{a_2^2+y^2}$$

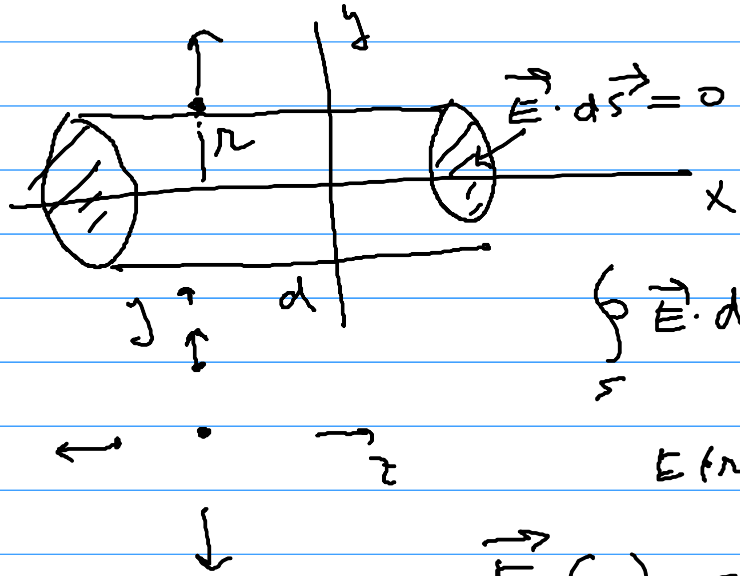
$$E_x = \frac{-\lambda}{4\pi\varepsilon_0}\left[\frac{1}{\sqrt{a_2^2+y^2}} - \frac{1}{\sqrt{a_1^2+y^2}}\right]$$

$$E_y = \frac{1}{4\pi\varepsilon_0}\int_{a_1}^{a_2}\frac{\lambda dx\cdot y}{(x^2+y^2)^{3/2}} = \frac{\lambda y}{4\pi\varepsilon_0}\int_{a_1}^{a_2}\frac{dx}{(x^2+y^2)^{3/2}} =$$

Složité, ale jde to ...

$\infty \qquad a_1 \to -\infty \qquad a_2 \to \infty \qquad E_x \to 0$

∞ PŘÍMKA GAUSSEM:



$$\oint_S \vec{E}\cdot d\vec{S} = \frac{Q_{in}}{\varepsilon_0}$$

$$E(r)\cdot 2\pi r d = \frac{d\lambda}{\varepsilon_0}$$

$$\vec{E}(r) = \frac{\lambda d}{\varepsilon_0 d 2\pi r} = \frac{1}{2\pi\varepsilon_0}\frac{\lambda}{r}\hat{r}$$

DÚ

$Q_1 = -Q_2$

$\vec{E}$ a) $r < R_1$ (GAUSSEM)

b) $R_1 < r < R_2$

c) $R_2 < r$

SOUSTŘEDNÉ

KOULE R_1, Q_1

SLUPKA $R_2, Q_2 = -Q_1$

$\varphi = ?$ a) b) c) ?

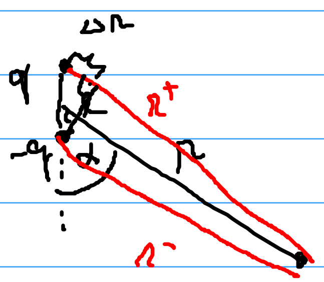
DIPÓL NA TŘI ZPŮSOBY

BOD. VÝBOJ $\vec{E}(r) = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}\hat{r}$

$$\vec{E} = -\nabla\varphi$$

$$\varphi(r) = \frac{1}{4\pi\varepsilon_0}\frac{q}{r} + C$$

$C = 0$



$\varphi = ?$

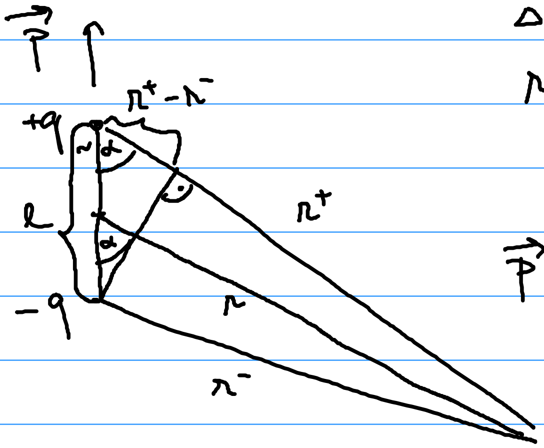
$E = ?$

DIPÓL: $\varphi = \varphi^+ + \varphi^- =$

$$= \frac{q}{4\pi\varepsilon_0}\left(\frac{1}{r^+} - \frac{1}{r^-}\right) =$$

$$= \frac{q}{4\pi\varepsilon_0} \frac{r^- - r^+}{r^+ r^-}$$

$r >> l$



$\Delta r \sim l \cdot \cos\alpha$

$r^+ r^- \sim r^2$

$$\varphi = \frac{-q}{4\pi\varepsilon_0} \frac{l \cdot \cos\alpha}{r^2}$$

$\vec{p} = \vec{l} \cdot q$

$\vec{p} \cdot \vec{r} = -pr \cos\alpha$

$$\varphi = \frac{1}{4\pi\varepsilon_0} \frac{\vec{p} \cdot \vec{r}}{r^3}$$