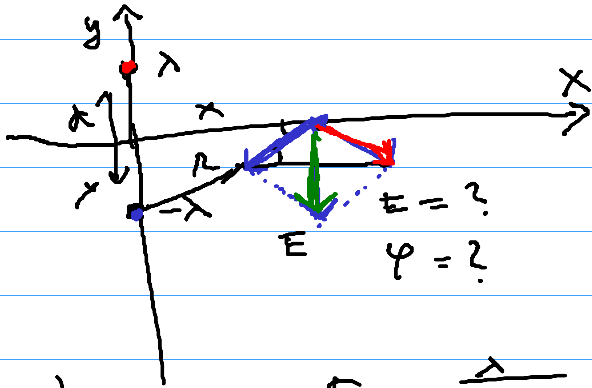
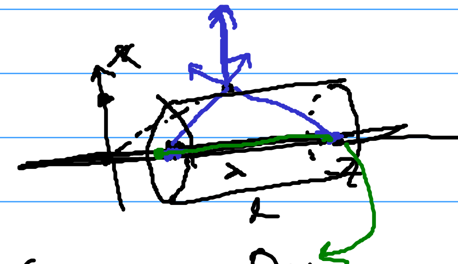
1.1.22.



$E = ?$

$\varphi = ?$



1 VODIČ: $\oint \vec{E}\cdot d\vec{S} = \frac{Q_{IN}}{\varepsilon_0}$

$E \cdot 2\pi r \cdot l = \frac{\lambda \cdot l}{\varepsilon_0}$

a) $E_\lambda = \frac{\lambda}{2\pi\varepsilon_0 r} = \frac{\lambda}{2\pi\varepsilon_0} \frac{1}{\sqrt{x^2+y^2}}$

$$\frac{\frac{E}{2}}{E_\lambda} = \frac{y}{\sqrt{x^2+y^2}} \rightarrow E = \frac{2yE_\lambda}{\sqrt{x^2+y^2}}$$

$$E = \frac{\lambda}{2\pi\varepsilon_0} \frac{d}{x^2+\frac{d^2}{4}}$$

b) $\varphi = ?$ $\vec{E} = -\nabla\varphi \rightarrow \varphi_{(M)} = \int_\infty^x \vec{E}\cdot d\vec{l}$

$$= \int_\infty^x \frac{\lambda}{2\pi\varepsilon_0} \frac{d \, dx'}{x'^2+\frac{d^2}{4}}$$

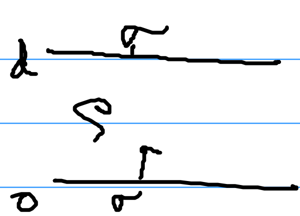
ZKUSIT DOMA NEBO SUPERPONOVAT

1.1.23

$\varphi = \alpha x^n$, $n > 1$ $\rho = ?$ $(0 < x < d)$

$\sigma(d) = ?$

$\sigma(0) = ?$



$\boxed{\Delta\varphi = \frac{\rho}{\varepsilon_0}}$ $= \nabla\cdot\underbrace{\vec{E}}_{-\nabla\varphi}$ $\boxed{\sigma = E_n \cdot \varepsilon_0}$

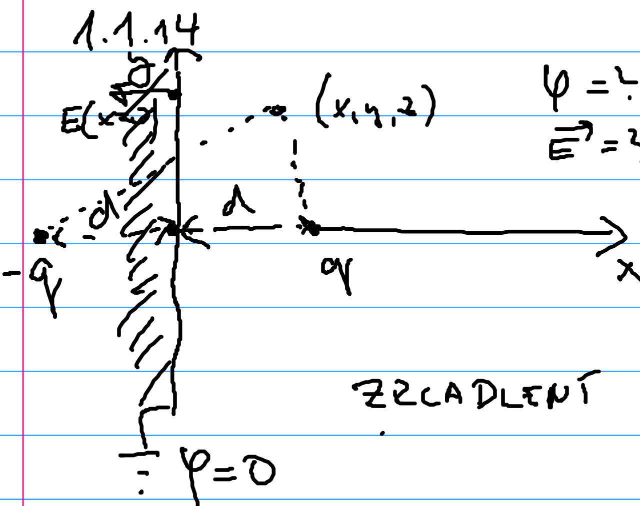
$$\Delta\varphi = \frac{\partial^2\varphi}{\partial x^2} + \frac{\partial^2\varphi}{\partial y^2} + \frac{\partial^2\varphi}{\partial z^2} = 2\cdot n(n-1)\cdot x^{n-2}$$

$$\rho = \varepsilon_0 \cdot 2\cdot n(n-1)x^{n-2}$$

$$\vec{E}_n = -\nabla\varphi = \left(-2n\,x^{n-1},\ 0,\ 0\right)$$

$$\sigma(0) = 0 \qquad \sigma(d) = -2n\,d^{n-1}\varepsilon_0$$

1.1.14



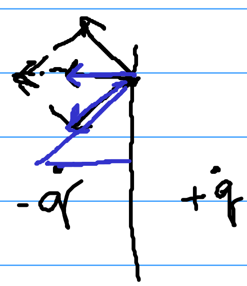
$\varphi = ?$
$\vec{E} = ?$

a) $$\varphi = \frac{q}{4\pi\varepsilon}\left(\frac{1}{\sqrt{(x-d)^2+y^2+z^2}} - \frac{1}{\sqrt{(x+d)^2+y^2+z^2}}\right)$$

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

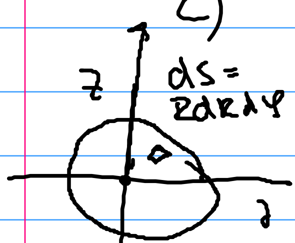
b) $\sigma = ?$ $\qquad \sigma = E(x=0)\cdot\varepsilon_0$

$$x=0:\quad E_q = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q}{d^2+y^2+z^2}$$



$$E = E_q\cdot\frac{d}{\sqrt{d^2+y^2+z^2}} = \frac{q}{4\pi\varepsilon_0}\,\frac{2d}{(d^2+y^2+z^2)^{3/2}}$$

$$\sigma = E\cdot\varepsilon_0 \qquad R^2 = y^2+z^2$$

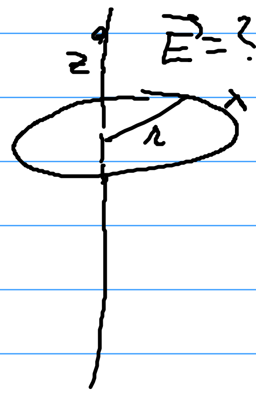


c) $$Q = \int_0^{2\pi}\!\!\int_0^{\infty}\sigma\, dR\, R\, d\varphi = \frac{qd}{2\pi}\int_0^{2\pi}\!\!\int_0^{\infty}\frac{R\,dR\,d\varphi}{(d^2+R^2)^{3/2}}$$

$$= \left[\begin{array}{l} t = d^2+R^2 \\ dt = 2R\,dR \end{array}\right] = \frac{q\,d\,2\pi}{4\pi}\int_{d^2}^{\infty}\frac{dt}{t^{3/2}} =$$

$$= \frac{qd}{2}\left[-2t^{-\frac{1}{2}}\right]_{d^2}^{\infty} = \underline{\underline{-q}}$$

D.Ú. 1.1.15



$\vec{E} = ?$ $\varphi = ?$

pole na ose homog. nabité kružnice