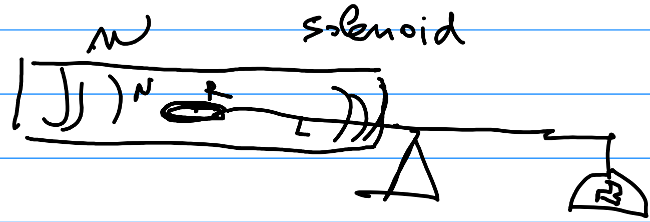
$\boxed{3.1.7}$



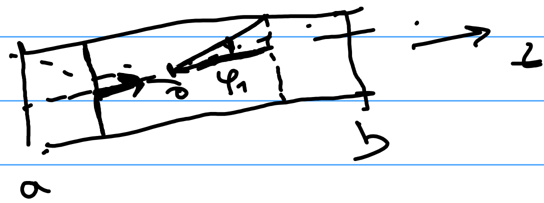
$$I = f(F_g)$$

$$\vec{F} = q\vec{v} \times \vec{B} \qquad d\vec{F} = I\, d\vec{l} \times \vec{B}$$

a) polje unutar solenoida

$$\rightarrow \oint \vec{B}\, d\vec{l} = \mu_0 I_{in}$$

1 zavoj, os: $\frac{\mu_0 I}{2} \frac{R^2}{(R^2+z^2)^{3/2}}$



$$B_z = \frac{\mu_0 I}{2} \int_a^b n\, dz \frac{R^2}{(R^2+z^2)^{3/2}}$$

↓ ([illegible])

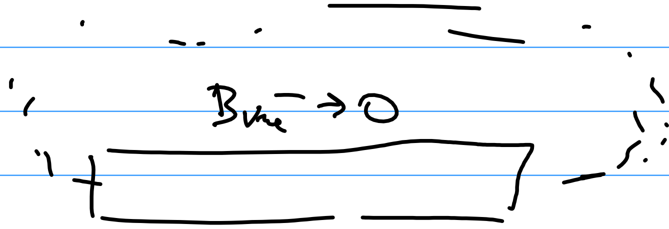
$$\frac{z}{\sqrt{R^2+z^2}}$$

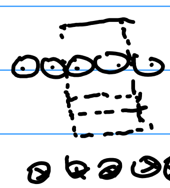
$$B_z = \frac{\mu_0 I}{2} n \left[\frac{z}{\sqrt{R^2+z^2}}\right]_a^b$$

$= \cos\varphi$

$a \to -\infty$, $b \to \infty$

$$B_z = \frac{\mu_0 I}{2} n \left(1 - (-1)\right) = \underline{\underline{\mu_0 I n}}$$





$\Rightarrow B_{in}$ konst.

$$\oint \vec{B} \cdot d\vec{l} = 2\pi r B = \mu_0 I N$$

$r \to \infty$ $\quad B = \frac{\mu_0 I N}{2\pi r} = \mu_0 I n$

$$d\vec{F} = I\, d\vec{l} \times \vec{B}$$

$$F = N \int_0^{2\pi} I R\, d\varphi\, B \cos\varphi = NIBR \int_0^{2\pi} \cos\varphi\, d\varphi = 0$$

$$M = N \int_0^{2\pi} I R\, d\varphi\, (L - R\cos\varphi) B \cos\varphi$$

$$= NIR^2 B \underbrace{\int_0^{2\pi} \cos^2\varphi\, d\varphi}_{\pi} = \pi N I R^2 B$$

$$= \mu_0 m N I^2 \pi R^2$$

VEKT. POT.

$$\vec{B} = \nabla \times \vec{A}$$

$$\nabla \cdot \vec{B} = 0$$

$$\nabla \times \vec{B} = \mu_0 \vec{j} \qquad \nabla \times \nabla \times \vec{A} = \nabla\underbrace{(\nabla \cdot \vec{A})}_{=0\ (\text{volba})} - \Delta \vec{A}$$

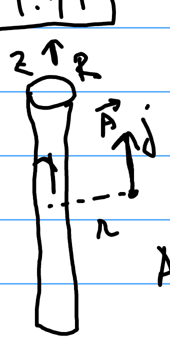
$$\Delta \vec{A} = -\mu_0 \vec{j}$$

$$\Delta \varphi = -\frac{\rho}{\varepsilon_0}$$

$$\varphi = \frac{1}{4\pi\varepsilon_0} \int_V \frac{\rho(\vec{r})}{R}\, dV$$

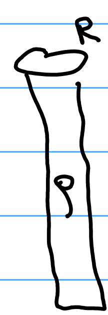
$$A_x = \frac{\mu_0}{4\pi} \int_V \frac{j_x(\vec{r})}{R}\, dV$$

$\boxed{3.1.11}$



, $\vec{A} = ?$

analog.:



$$E \cdot 2\pi r \cdot l = \frac{\rho \pi R^2 l}{\varepsilon_0}$$

$$E = \frac{1}{2\varepsilon_0} \frac{\rho R^2}{r}$$

$$\varphi = -\frac{\rho R^2}{2\varepsilon_0} \ln r$$

$$A_z = -\frac{j R^2 \mu_0}{2} \ln r$$

$r=\sqrt{x^2+y^2}$

$$\vec B = \nabla\times\vec A = \nabla\times(0,0,c\ln r)$$

$$= \begin{vmatrix} \hat x & \hat y & \hat z \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ 0 & 0 & c\ln r \end{vmatrix} = \left(c\frac{\partial}{\partial y}\ln r,\ -c\frac{\partial}{\partial x}\ln r,\ 0\right)$$

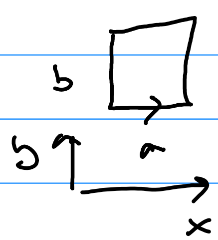
$$= c\Big($$

$$\frac{\partial}{\partial y}\ln\sqrt{x^2+y^2} = \frac{1}{\sqrt{x^2+y^2}}\cdot\frac{1}{2}\frac{1}{\sqrt{x^2+y^2}}\cdot 2y = \frac{y}{x^2+y^2}$$

$$= \frac{R^2 j\mu_0}{2}\left(\frac{y}{r^2},\ -\frac{x}{r^2},\ 0\right)$$

cylindr. $B_\varphi = \frac{\mu_0 I}{2\pi r}$

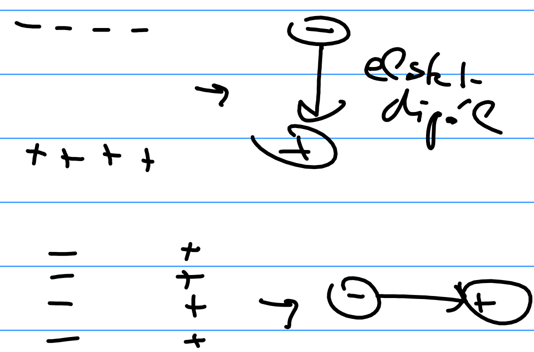
D.Ú. mag. dipól a potenciál pomocí elektr. analogie



$\vec A = ?$

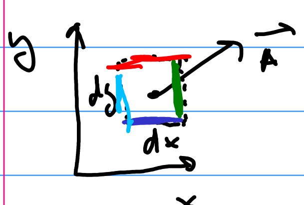
$A_x \ldots j_x$

$A_y \ldots j_y$



$\vec B = ?$

Význam $\nabla\times\vec A$



$$\oint \vec A\cdot d\vec l = \underbrace{\left(\cancel{A_x} - \frac{\partial A_x}{\partial y}\frac{dy}{2}\right)dx}$$

$$+ \underbrace{\left(\cancel{A_y} + \frac{\partial A_y}{\partial x}\frac{dx}{2}\right)dy} - \underbrace{\left(\cancel{A_x} + \frac{\partial A_x}{\partial y}\frac{dy}{2}\right)dx}$$

$$- \underbrace{\left(\cancel{A_y} - \frac{\partial A_y}{\partial x}\frac{dx}{2}\right)dy} = -\frac{\partial A_x}{\partial y}dy\,dx + \frac{\partial A_y}{\partial x}dx\,dy$$

$$-\left(\frac{\partial A_y}{\partial x}-\frac{\partial A_x}{\partial y}\right)dx\,dy = \left(\nabla\times\vec{A}\right)\cdot d\vec{S}$$

$$T(\vec{r}+d\vec{r}) = T(\vec{r}) + \nabla T\cdot d\vec{r}$$