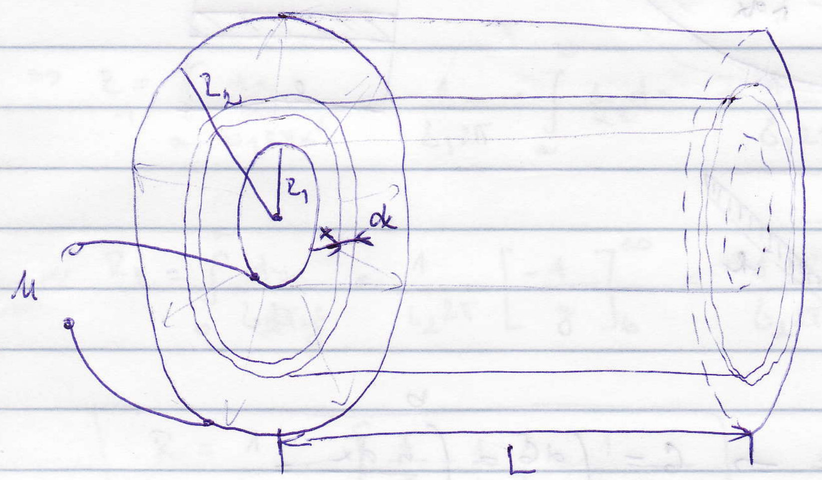
$$J = \frac{s \cdot N_A \cdot e \cdot v}{M} \Rightarrow v = \frac{J \cdot M}{s \cdot N_A \cdot e} = \frac{4 I \cdot M}{\pi d^2 s \cdot N_A \cdot e}$$

c) $Q = I \cdot t$

d) $U = R \cdot I = I \cdot \rho \cdot \frac{L \cdot 4}{\pi d^2}$

SEMINÁR 30. 3. 10

(P2) koaxial, r_1, l, r_2, dutelektrikum so σ, U.



a) $I = ?$ vzdialenosť od osi

b) $J(r) = ?$

c) $Q = ?$

$\rho = \frac{1}{\sigma}$

a)

$$I = \frac{U}{R} \qquad R = \int dR = \rho \cdot \frac{dl}{S} = \int_{R_1}^{R_2} \frac{1}{\sigma} \cdot \frac{dx}{2\pi x \cdot L} =$$

$$= \frac{1}{\sigma 2\pi L} \cdot \int_{R_1}^{R_2} \frac{dx}{x} = \frac{1}{\sigma 2\pi L} \cdot \ln \frac{R_2}{R_1}$$

$$I = \frac{U \cdot \sigma \cdot 2\pi L}{\ln \frac{R_2}{R_1}}$$

b) $$J = \frac{I}{S} = \frac{U \cdot \sigma \cdot 2\pi L}{\ln \frac{R_2}{R_1} \cdot \underbrace{2\pi r \cdot L}_{S}} = \frac{U \cdot \sigma}{r \cdot \ln \frac{R_2}{R_1}}$$

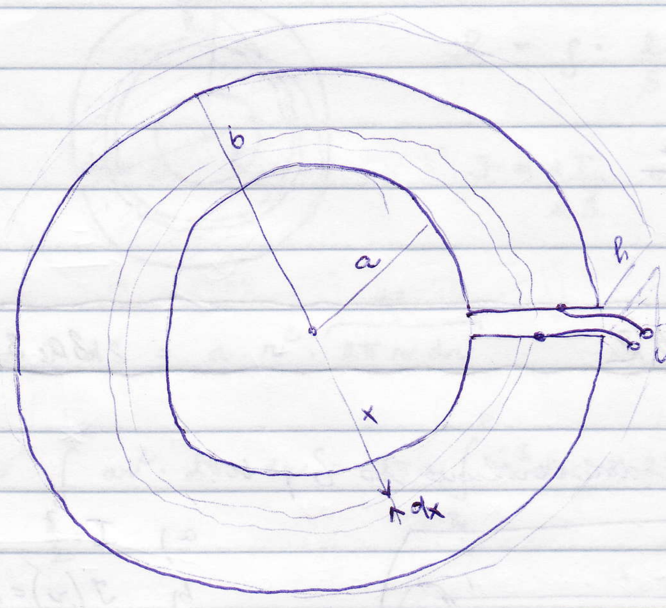
$\sim J(r)$

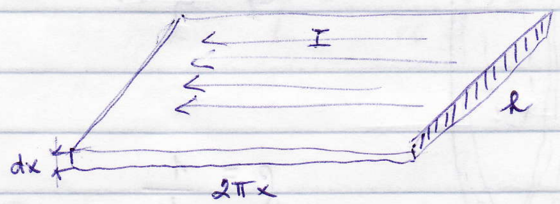
c) $m \cdot a = E \cdot e \Rightarrow \boxed{a = \frac{E \cdot e}{m}}$

→

$$P = \frac{W}{t} \Rightarrow W = P \cdot \overset{1s}{t} = U \cdot I = \frac{U^2 \cdot \sigma \cdot 2\pi L}{\ln \frac{r_2}{r_1}}$$

PR



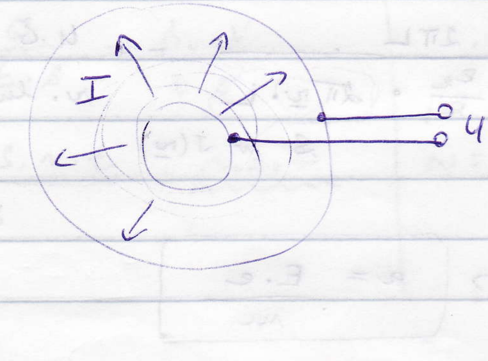


$$dR = \rho \cdot \frac{dl}{S} = \rho \cdot \frac{2\pi x}{h \cdot dx} \Rightarrow G = \int dG = \int_a^b \frac{h \cdot dx}{\rho \cdot 2\pi x} =$$

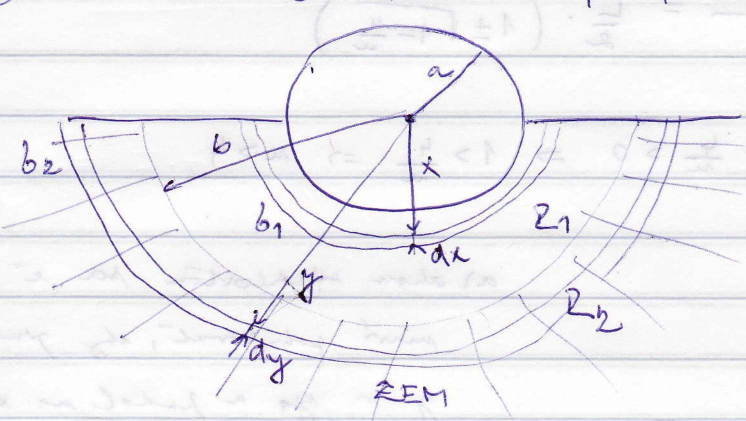
$$= \frac{h}{\rho \cdot 2\pi} \cdot \int_a^b \frac{dx}{x} = \frac{h}{\rho \cdot 2\pi} \cdot \ln \frac{b}{a}$$

$$R = \frac{1}{G} = \frac{\rho \cdot 2\pi}{h \cdot \ln \frac{b}{a}}$$

! **Pozn.** ať bude napětí připojené na libovolný poloměr a nejkratší proud bude téct takto!



(Pr) $\sigma_1 > \sigma_2$; $R = ?$; a, b



$$R = R_1 + R_2$$

$$dR = \rho \cdot \frac{dl}{S} \Rightarrow dR = \frac{1}{\sigma_1} \cdot \frac{dx}{2\pi x^2}$$

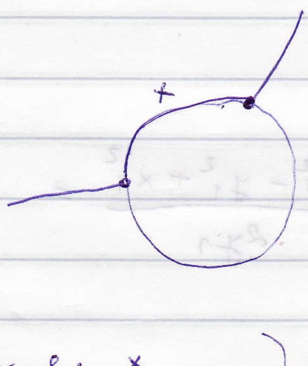
$$\Rightarrow R_1 = \int_a^b \frac{dx}{\sigma_1 2\pi x^2} = \frac{1}{\sigma_1 2\pi} \cdot \int_a^b \frac{1}{x^2} dx = \frac{1}{\sigma_1 2\pi}\left[-\frac{1}{x}\right]_a^b = \frac{1}{\sigma_1 2\pi}\left[-\frac{1}{b} + \frac{1}{a}\right]$$

$$\Rightarrow R_2 = \int_b^\infty \frac{dy}{\sigma_2 2\pi y^2} = \frac{1}{\sigma_2 2\pi}\left[-\frac{1}{y}\right]_b^\infty = \frac{1}{\sigma_2 2\pi} \cdot \left[-\frac{1}{\infty} + \frac{1}{b}\right] = \frac{1}{\sigma_2 2\pi b}$$

$$\boxed{R = \frac{1}{\sigma_1 \cdot 2\pi}\left[\frac{1}{a} - \frac{1}{b}\right] + \frac{1}{\sigma_2 \pi \cdot 2 \cdot b}}$$

(Pr.)

obruč : L, ρ, R_0 Jade treba prívody pouidu, aby sa odpor zmenšil n-krát. $\boxed{R = \frac{R_0}{n}}$



$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$R = \frac{R_1 \cdot R_2}{R_1 + R_2}$$

$$R_0 = \rho \cdot \frac{L}{S}$$

$$\boxed{\rho = \frac{S \cdot R_0}{L}} \; !$$

$$\left.\begin{aligned} R_1 &= \rho \cdot \frac{x}{S} \\ R_2 &= \rho \cdot \frac{L-x}{S} \end{aligned}\right\} \Rightarrow \frac{R_0}{n} = \frac{\rho \cdot \frac{x}{\cancel{S}} \cdot \rho \cdot \frac{(L-x)}{S}}{\rho \cdot \frac{x}{S} + \rho \cdot \frac{(L-x)}{\cancel{S}}} = \frac{x(L-x) \cdot \frac{\cancel{S} \cdot R_0}{L \cdot \cancel{S}}}{\cancel{x} + L - \cancel{x}} =$$

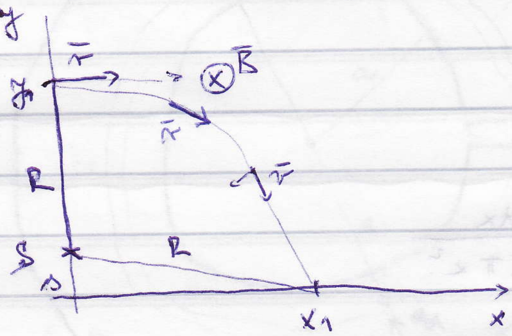
$$\frac{\cancel{R_0}}{n} = \frac{x(L-x) \cdot \cancel{R_0}}{L^2} \Rightarrow \boxed{x^2 - xL + \frac{L^2}{n} = 0}$$

$\longrightarrow$

$$x_{1,2} = \frac{L \pm \sqrt{L^2 - \frac{4L^2}{n}}}{2} = \frac{L}{2} \cdot \left(1 \pm \sqrt{1 - \frac{4}{n}}\right)$$

aby to malo zmysel $1 - \frac{4}{n} > 0 \Rightarrow 1 > \frac{4}{n} \Rightarrow \underline{n > 4}$

12. $B \perp xy$



a) akou rýchlosťou sa e⁻ musí pohybovať, aby po... y v y_1 a padol na x... porušenie e, m.

$$\boxed{\bar{F} = q \cdot \bar{v} \times \bar{B}} \Rightarrow F = q \cdot v \cdot B \cdot \underbrace{\sin 90°}_{1}$$

$$F_d = \frac{m \cdot v^2}{R} = q \cdot v \cdot B$$

$$\hookrightarrow v = \frac{q \cdot B}{m} \cdot R$$

$$R = (y_1 - s)$$

$$R = \sqrt{s^2 + x_1^2}$$

$$y_1 - s = \sqrt{s^2 + x_1^2}$$

$$y_1^2 - 2sy_1 + s^2 = s^2 + x_1^2$$

$$y_1^2 - x_1^2 = 2sy_1$$

$$\frac{y_1^2 - x_1^2}{2y_1} = s$$

$$R = y_1 - \frac{y_1^2 - x_1^2}{2y_1} = \frac{2y_1^2 - y_1^2 + x_1^2}{2y_1} = \frac{y_1^2 - y_1^2 + x_1^2}{2y_1} =$$

$$= \frac{y_1^2 + x_1^2}{2y_1}$$

$$v = \frac{q \cdot B}{m} \cdot \frac{y_1^2 + x_1^2}{2y_1}$$