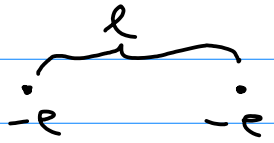
1.1.1 (PŘ. z el. a mag. , SEDLÁK + KOL.)



$e = 1.6 \times 10^{-19} C$

$\varepsilon_0 = 8.85 \times 10^{-12} C^2/Nm^2$

$\varkappa = 6.67 \times 10^{-11} m^3 kg^{-1} s^{-2}$

$m = ?$ $\quad F_g = F_E$

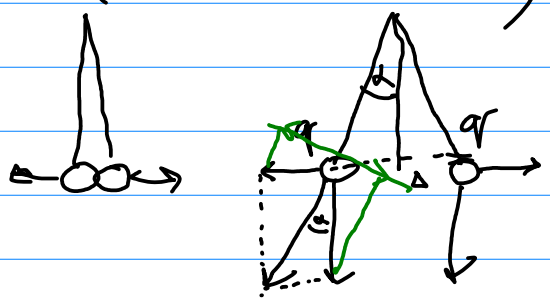
1.86×10^{-9} kg

$\varkappa \frac{m^2}{l^2} = \frac{1}{4\pi\varepsilon_0} \frac{e^2}{l^2}$

$m_p = 1.7 \times 10^{-27}$ kg

$10^{18} \times$ SILNĚJŠÍ !

1.1.5 (MĚŘENÍ NÁBOJE)



$q = ?$ $\quad m, l$

$m = 1$ g

$l = 1$ m

$\Delta = 5$ cm

$q_1 = q_2 = ?$

$tg\alpha \doteq \sin\alpha = \frac{F_E}{F_G}$

$\sin\alpha = \frac{\Delta}{l}$

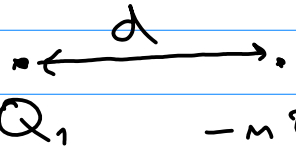
$F_E = F_G \frac{\Delta}{l}$

$F_E = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q^2}{4\Delta^2} = mg \cdot \frac{\Delta}{l}$

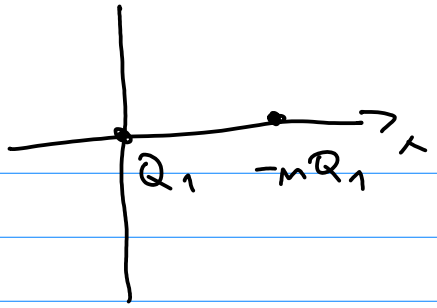
$q = 8.3 \times 10^{-9} C$

1.1.9

NULOVÝ POT. = ?



$\varphi = \frac{1}{4\pi\varepsilon_0} \sum \frac{q_i}{r_i}$



$$0 = V = \frac{1}{4\pi\varepsilon_0}\left(\frac{Q_1}{|\vec{r}|} - \frac{mQ_1}{|\vec{r}-\vec{d}|}\right)$$

$$\frac{1}{\sqrt{x^2+y^2+z^2}} = \frac{m}{\sqrt{(x-d)^2+y^2+z^2}}$$

$$x^2+y^2+z^2 = \left[(x-d)^2+y^2+z^2\right] / m^2$$

$$m^2x^2 - (x-d)^2 + y^2(m^2-1) + z^2(m^2-1) = 0$$

$$x^2(m^2-1) + 2xd - d^2 + \text{-11-} = 0$$

$$x^2 + \frac{2xd-d^2}{m^2-1} + y^2 + z^2 = 0$$

$$(x+a)^2 + b + y^2 + z^2 = 0$$

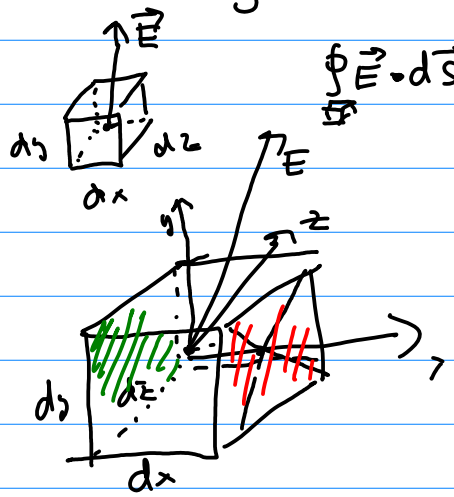
KULOVÁ PLOCHA

$$\left(x + \frac{d}{m^2-1}\right)^2 + y^2 + z^2 = \underbrace{\left(\frac{dm}{m^2-1}\right)^2}_{R}$$

$$R = \frac{dm}{m^2-1}$$

$$S = \left(-\frac{d}{m^2-1}, 0, 0\right)$$

GZ $\quad \oint \vec{E}\cdot d\vec{S} = \frac{Q_{in}}{\varepsilon_0}$



$$T' = T + \nabla T \cdot d\vec{r}$$

$$S_1: \quad \int_{S_1} = \int_{S_1}\left(\vec{E} + \frac{\partial \vec{E}}{\partial x}\frac{dx}{2}\right)\cdot \hat{x}\, dS$$

$$= \left(E_x + \frac{\partial E_x}{\partial x}\frac{dx}{2}\right) dy\, dz$$

$$S_2: \quad \int_{S_2} = \int_{S_2}\left(\vec{E} - \frac{\partial \vec{E}}{\partial x}\frac{dx}{2}\right)\cdot(-\hat{x})\, dS$$

$$= -\left(E_x - \frac{\partial E_x}{\partial x}\frac{dx}{2}\right) dy\, dz$$

$$\int_{S_1} + \int_{S_2} = \frac{\partial E_x}{\partial x} dx\, dy\, dz = \frac{\partial E_x}{\partial x} dV$$

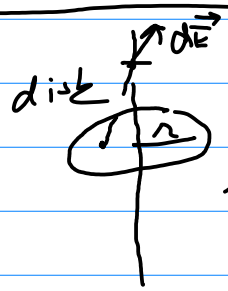
y: $\int_{S_3} + \int_{S_4} = \frac{\partial E_y}{\partial y} dV$

$\int_{S_5} + \int_{S_6} = \frac{\partial E_z}{\partial z} dV$

$\oint \vec{E} \cdot d\vec{S} = \nabla \cdot \vec{E} \, dV$

$\oint \vec{E} \cdot d\vec{S} = \int \nabla \cdot \vec{E} \, dV$

D.Ú.



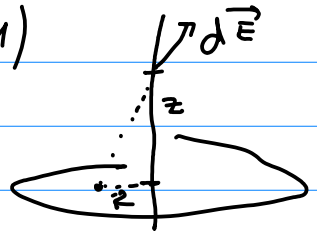
σ ... plošná hustota náboje

1) $\vec{E}$ na ose disku

2) $R \to \infty$ $\vec{E}$ nabité desky

3) 2) pomocí Gauss. v. — volitelné

1)



$|d\vec{E}| = \frac{1}{4\pi\varepsilon_0} \cdot \frac{\sigma \cdot R \, d\varphi \, dR}{z^2 + R^2}$