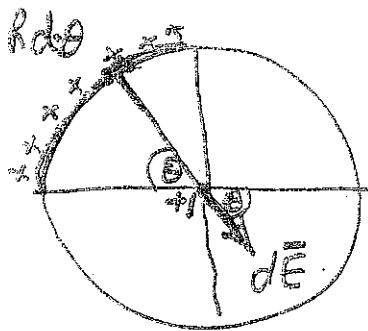


27/12/2013 ת"ר צ"ח נ"ח



$$d\vec{E} = k \frac{dq}{R^2} = k \frac{\lambda R d\theta}{R^2}$$

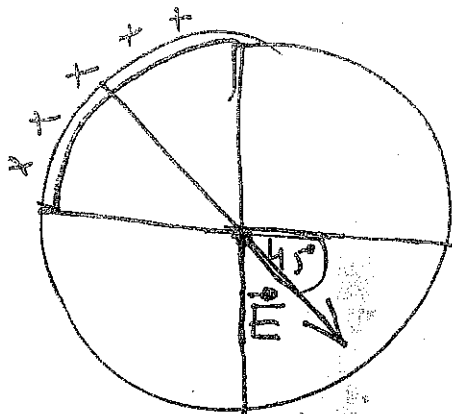
$$d\vec{E} = k \frac{\lambda d\theta}{R}$$

$$dE_x = k \frac{\lambda \cos\theta}{R} d\theta$$

$$E_x = k \frac{\lambda}{R} [\sin\theta]_0^{90} = k \frac{\lambda}{R}$$

$$dE_y = k \frac{\lambda \sin\theta}{R} d\theta$$

$$E_y = k \frac{\lambda}{R} [-\cos\theta]_0^{90} = k \frac{\lambda}{R}$$



$$E = \sqrt{E_x^2 + E_y^2} = k \sqrt{2} \frac{\lambda}{R}$$

$$\lambda \frac{2\pi R}{4} = q \rightarrow \lambda = \frac{2q}{\pi R}$$

$$E = k \frac{\sqrt{2}}{R} \left(\frac{2q}{\pi R} \right) = k \frac{2\sqrt{2}q}{\pi R^2}$$

$$\vec{E} = \frac{2\sqrt{2}q}{\pi R^2}$$

(45° ~ 152)

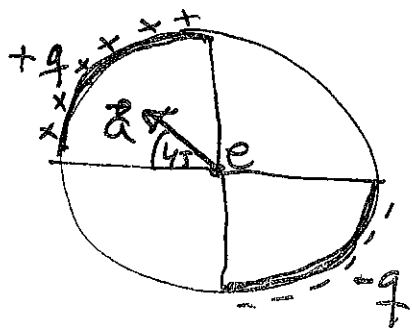
$$\sqrt{2} E = 2 \left(\frac{2\sqrt{2}q}{\pi R^2} \right) = \frac{4\sqrt{2}q}{\pi R^2}$$

(45° ~ 152) (?)

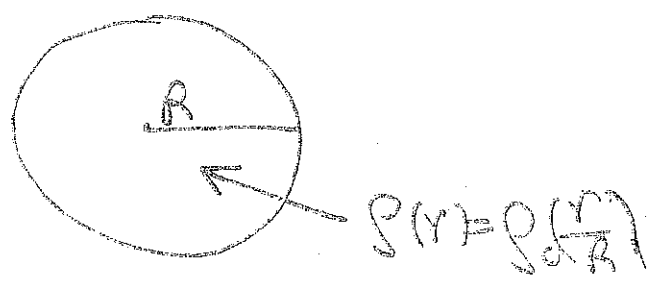
$$F = ma$$

$$eE = ma \quad a = \frac{eE}{m}$$

$$\vec{a} = \frac{4\sqrt{2}eq}{\pi R^2 m} \quad (\text{הכיוון של החץ}) \quad 45^\circ \sim 152$$



(2)



$$Q = \int_0^R \rho(r) 4\pi r^2 dr$$

Q 4πr² ρ dr

$$Q = \frac{\rho_0}{R} 4\pi r \cdot r^2 dr = \frac{4\pi\rho_0}{R} \left[\frac{r^4}{4} \right]_0^R = \frac{\pi\rho_0}{R} R^4 = \pi\rho_0 R^3$$

$Q = \rho_0 \pi R^3$

C

$$\vec{E} = k \frac{Q}{r^2} \hat{r} = k \frac{\rho_0 \pi R^3}{r^2} \hat{r}$$

(R < r) Q 4πr² ρ dr (1)

$$\epsilon_0 \oint \vec{E} \cdot d\vec{s} = \sum q$$

4πr² ρ dr (2)

$$\epsilon_0 E 4\pi r^2 = \rho_0 \pi r^4 \quad E = \frac{1}{4\pi\epsilon_0} \frac{\rho_0 \pi r^2}{R} = \left(\frac{\rho_0}{4\epsilon_0 R} \right) r^2$$

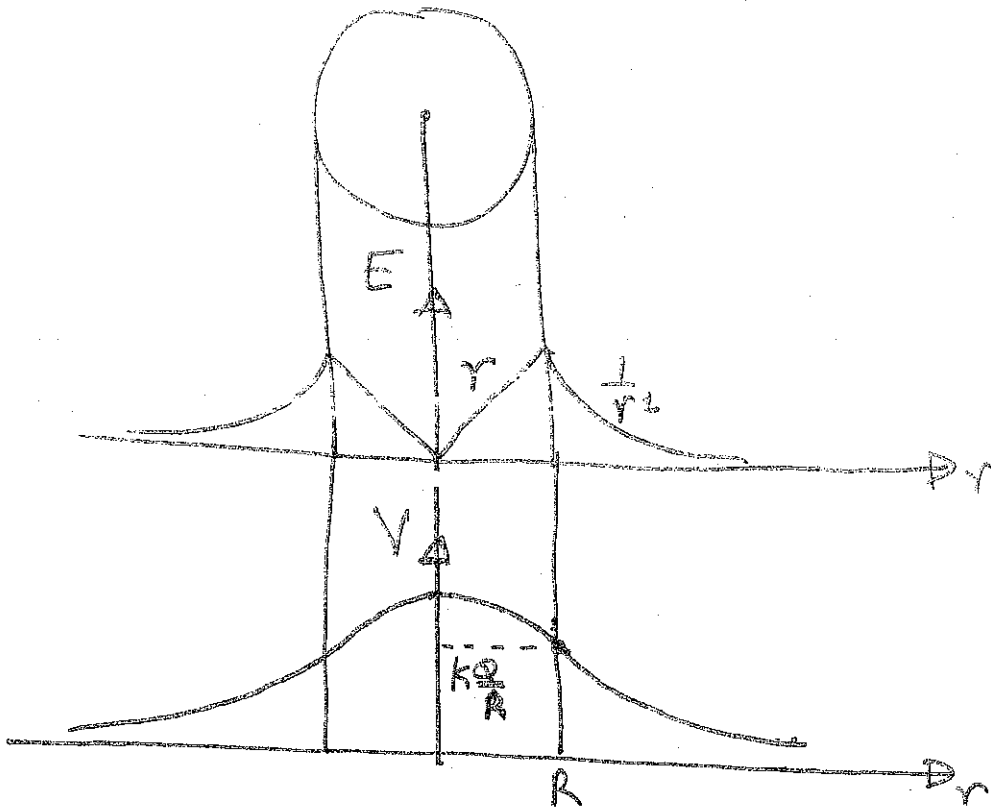
$$V = - \int_{\infty}^r \vec{E} \cdot d\vec{r} = - \int_{\infty}^r k \frac{Q}{r^2} dr = \left[k \frac{Q}{r} \right]_{\infty}^r = k \frac{Q}{r}$$

Q 4πr² ρ dr (3)

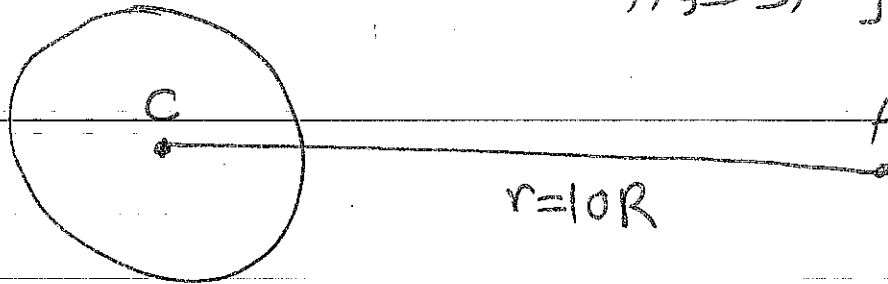
$$V = - \int_{\infty}^R \vec{E} \cdot d\vec{r} - \int_R^r \vec{E} \cdot d\vec{r} = k \frac{Q}{R} - \frac{\rho_0}{4\epsilon_0 R} \int_R^r r^2 dr$$

$$= k \frac{Q}{R} - \frac{\rho_0}{4\epsilon_0 \cdot 3R} (r^3 - R^3) = k \frac{Q}{R} + \frac{\rho_0 R^3}{12\epsilon_0 R} - \frac{\rho_0 r^3}{8\epsilon_0 R}$$

ρ 4πr² ρ dr (4)



(5) מה הכמות המרבית של מטען $+q$ שאפשר לשים על המוט A בלי שיתפרק?
 מה המטען המרבי על המוט A בלי שיתפרק?
 מה המטען המרבי על המוט B בלי שיתפרק?



$$W = \Delta V \cdot q = (V_C - V_A) q = \left[\left(k \frac{Q}{R} + \frac{\rho_0 R^2}{12\epsilon_0} \right) - k \frac{Q}{10R} \right] q$$

$$Q = \rho_0 \pi R^3$$

$$W = \left(k \frac{\rho_0 \pi R^3}{R} + \frac{\rho_0 R^2}{12\epsilon_0} - k \frac{\rho_0 \pi R^3}{10R} \right) q$$

$$W = \left(\frac{\rho_0}{4\epsilon_0} R^2 + \frac{\rho_0 R^2}{12\epsilon_0} - \frac{\rho_0}{40\epsilon_0} R^2 \right) q =$$

$$q \left(\frac{1}{3\epsilon_0} \rho_0 R^2 - \frac{\rho_0 R^2}{40\epsilon_0} \right)$$

$$\frac{\rho_0 R^2}{40\epsilon_0}$$

$$W = \left(\frac{1}{3\epsilon_0} - \frac{1}{40\epsilon_0} \right) \rho_0 R^2 q$$

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$$V = k \frac{Q}{r}$$

$$E = k \frac{Q}{r^2}$$

$$R < r$$

$$V = k \frac{Q}{R} + \frac{\rho_0 R^2}{8\epsilon_0} - \frac{\rho_0}{8\epsilon_0} r^2$$

$$E = \frac{\rho_0}{4\epsilon_0} r$$

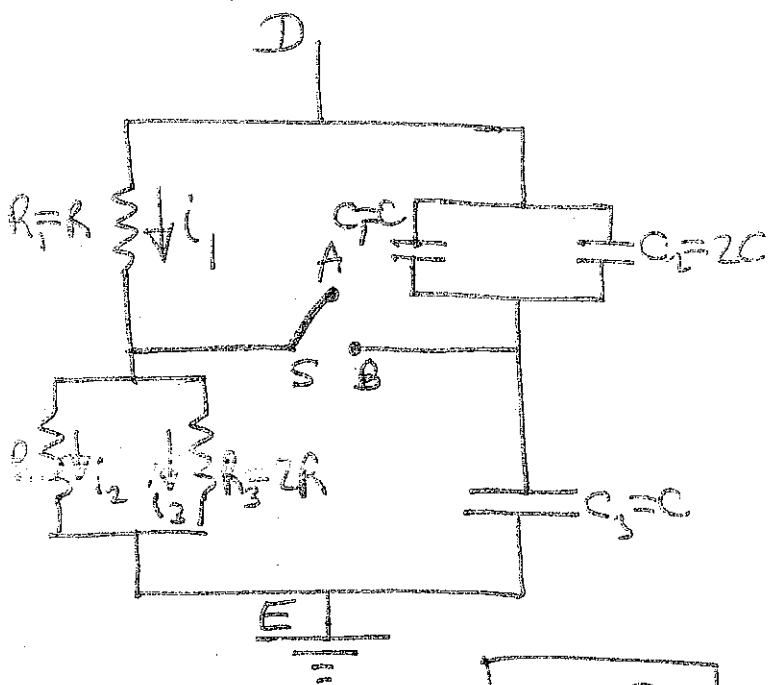
$$R < r$$

$$E = - \frac{dV}{dr}$$

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$$V = - \int E \cdot dr$$

(3)



~132 VAA Nr 2019 (A)
 a) f) e) d)

$$\frac{1}{R'} = \frac{1}{R} + \frac{1}{2R} = \frac{3}{2R}$$

$$R' = \frac{2}{3}R$$

$$R_t = R + \frac{2}{3}R = \frac{5}{3}R$$

$$R_t = \frac{5}{3}R$$

$$i_1 = \frac{V}{R_t} = \frac{V}{\frac{5}{3}R} = \frac{3}{5} \frac{V}{R} ; i_2 = \frac{2}{5} \frac{V}{R} ; i_3 = \frac{1}{5} \frac{V}{R}$$

$$e' = C + 2C = 3C$$

(2)

$$\frac{1}{C_t} = \frac{1}{C'} + \frac{1}{C} = \frac{1}{3C} + \frac{1}{C} = \frac{4}{3C}$$

$$C_t = \frac{3}{4}C$$

$$q = C_t V = \frac{3}{4} CV$$

$$q_3 = \frac{3}{4} CV ; q_1 = \frac{1}{4} CV ; q_2 = \frac{2}{4} CV$$

$$V_A + i_1 R - \frac{q_1}{C_1} = V_B$$

$$V_A - V_B = \frac{q_1}{C_1} - i_1 R$$

(b)

$$V_{AB} = \frac{1}{4} \frac{CV}{C} - \frac{3}{5} \frac{V}{R} R = \frac{1}{4} V - \frac{3}{5} V = -0.35V$$

$$V_{AB} = -0.35V$$

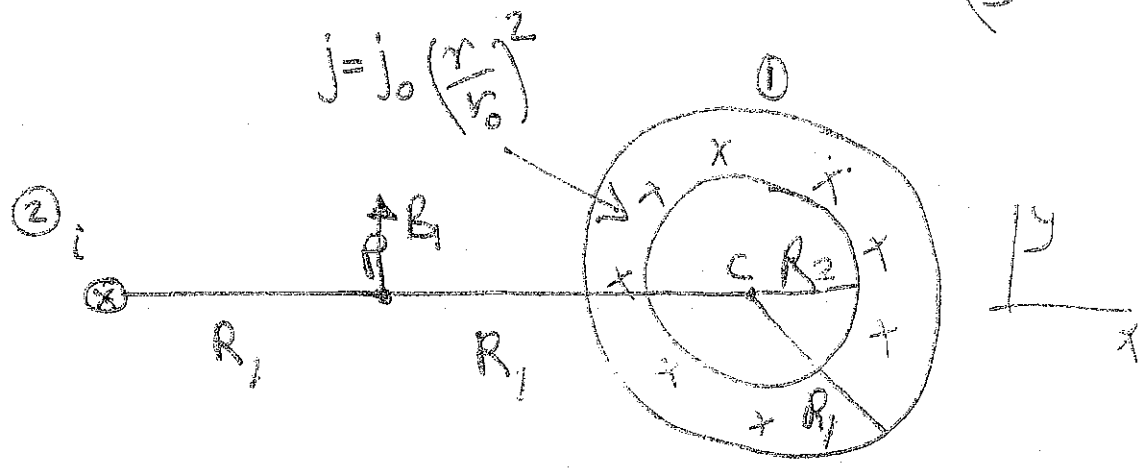
: AB f) e) d) Nr 2019, S podana na f) g) h) (3)
 f) g) h) i) j) k) l) m) n) o) p) q) r) s) t) u) v) w) x) y) z)

$$i_1 = \frac{3}{5} \frac{V}{R} ; i_2 = \frac{2}{5} \frac{V}{R} ; i_3 = \frac{1}{5} \frac{V}{R}$$

$$V_{e1} = i_1 R = \frac{3}{5} V ; q_1 = \frac{3}{5} CV$$

(5)

(5)



חישוב אורך הזרם (1)

$$I = \int_{R_2}^{R_1} j \cdot 2\pi r \, dr = \int_{R_2}^{R_1} j_0 \left(\frac{r}{r_0}\right)^2 \cdot 2\pi r \, dr$$

$$I = \frac{j_0 \cdot 2\pi}{r_0^2} \int_{R_2}^{R_1} r^3 \, dr = \frac{2\pi j_0}{4r_0^2} (R_1^4 - R_2^4)$$

$$B(c) = 0$$

(2)

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 \cdot I_{enc}$$

$$B \cdot 2\pi(2R_1) = \mu_0 I$$

$$B = \frac{\mu_0 I}{4\pi R_1}$$

$$B(p) = \frac{\mu_0 I}{4\pi R_1}$$

העברת המשוואה למצב של i

$$B_c = \frac{\mu_0 i}{2\pi(3R_1)} \downarrow (-y)$$

העברת המשוואה למצב של i

$$B_p = \frac{\mu_0 i}{4\pi R_1} \downarrow (-y)$$

$$\frac{\mu_0 I}{4\pi R_1} - \frac{\mu_0 i}{4\pi R_1} = \frac{\mu_0 i}{6\pi R_1}$$

$$\frac{I}{4} - \frac{i}{2} = \frac{i}{6} \quad (3)$$

$$\frac{I}{4} = \frac{4}{6} i$$

$$i = \frac{6}{16} I$$

חישוב אורך הזרם