F2 ZS 2025 PÍSOMKA 2 RIEŠENIE

1. C_1, C_2, C_3, U_m

Q;

$$C = \frac{Q}{U_m}$$

$$Q = CU_m$$

$$C = C_1 + C_{23}$$

$$C = C_1 + \frac{C_2 C_3}{C_2 + C_3}$$

$$\frac{1}{C_{23}} = \frac{1}{C_2} + \frac{1}{C_3} = \frac{C_2 + C_3}{C_2 C_3}$$

$$C_{23} = \frac{C_2 C_3}{C_2 + C_3}$$

$$\boxed{Q = \left(C_1 + \frac{C_2 C_3}{C_2 + C_3}\right) U_m}$$

2. $R, t_1, I_1, t_2, I_2, I(t) = kt + q$

W;

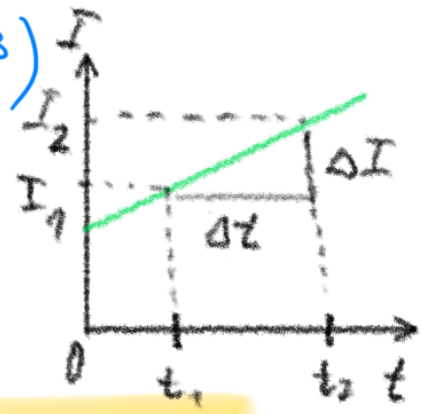
$$P = RI^2 \qquad dW = RI^2 dt$$

$$I = kt + q$$

$$W = \int_{t_1}^{t_2} R(kt+q)^2 dt = \left| \begin{array}{l} I = kt+q \\ dI = k\,dt \end{array} \right| = \frac{R}{k} \int_{I_1}^{I_2} I^2 dI =$$

$$= \frac{R}{k} \left[\frac{1}{3} I^3 \right]_{I_1}^{I_2} = \frac{R}{3k} \left(I_2^3 - I_1^3 \right)$$

$$k = \frac{I_2 - I_1}{t_2 - t_1}$$

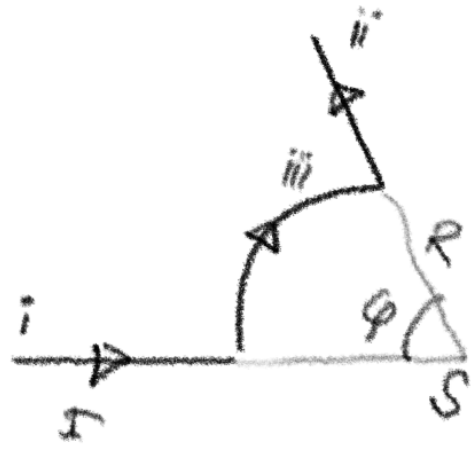


$$\boxed{W = \frac{R}{3} \frac{t_2 - t_1}{I_2 - I_1} \left(I_2^3 - I_1^3 \right) = \frac{1}{3} R \left(I_1^2 + I_2^2 + I_1 I_2 \right)(t_2 - t_1)}$$

3 I_1, R_1, φ

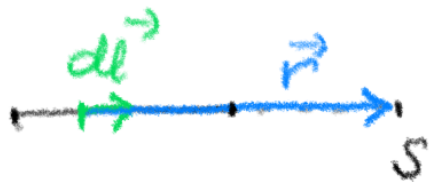
B;

$$\vec{B} = \vec{B_i} + \vec{B_{ii}} + \vec{B_3}$$



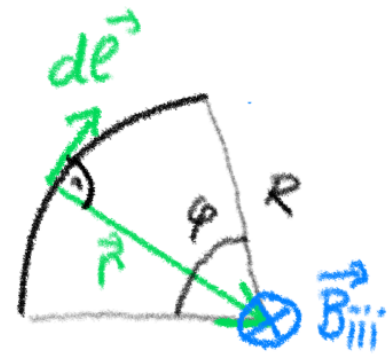
$$d\vec{B} = \frac{\mu_0}{4\pi} I \frac{d\vec{l} \times \vec{r}}{r^3}$$

i, ii) $\vec{B_i} = \vec{B_{ii}} = 0$ lebo $d\vec{l} \parallel \vec{r}$



iii) $\vec{B_{iii}}$ má smer do nátresne $\otimes \vec{B_{iii}}$

a $\vec{r} \perp d\vec{l} \Rightarrow |d\vec{l} \times \vec{r}| = r\,dl = R\,dl$

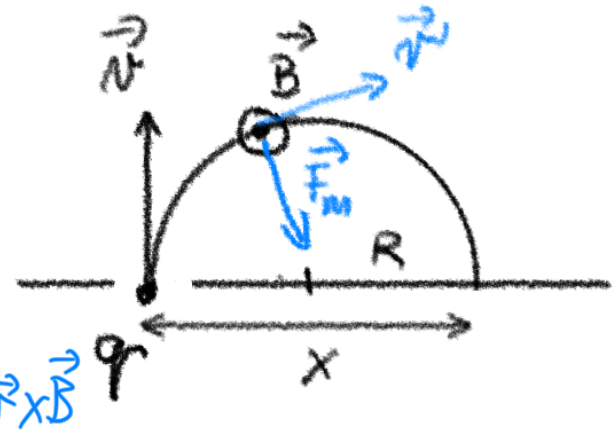


$$dB = \frac{\mu_0}{4\pi} I \frac{dl}{R^2} = \frac{\mu_0 I}{4\pi} \frac{R\,d\varphi}{R^2} = \frac{\mu_0 I}{4\pi R} d\varphi$$

$$B_{iii} = \frac{\mu_0 I}{4\pi R} \int_0^{\varphi} d\varphi = \frac{\mu_0 I \varphi}{4\pi R} \quad ; \quad B = B_{iii}$$

$B = \frac{\mu_0 I \varphi}{4\pi R}$ a smer má do nátresne $\otimes$.

4. $\frac{\vec{B}, \vec{v}, x, q}{m}$



magnetická sila $F_m = q\vec{v} \times \vec{B}$

$\vec{v} \perp \vec{B} \Rightarrow F_m = qvB$ smeruje do stredu kružnice

Pohyb po kružnici → existuje dostredivá sila

$$F_d = m \frac{v^2}{R} \qquad R = \frac{x}{2} \Rightarrow F_d = 2m \frac{v^2}{x}$$

$$F_d = F_m$$

$$2m \frac{v^2}{x} = qvB$$

$$m = \frac{qBx}{2v}$$