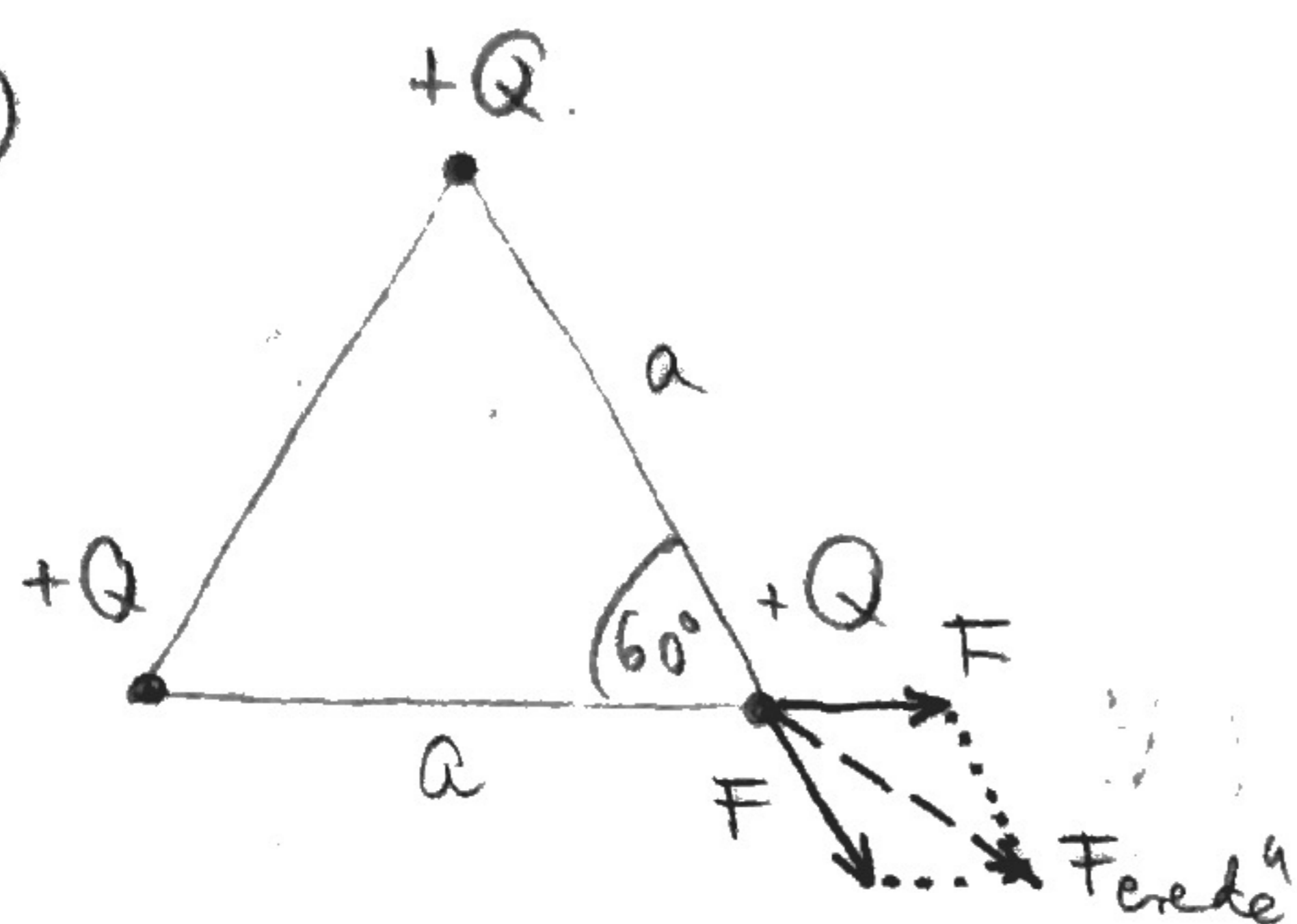


# 1. rész (megoldások)

1.)



$$F_{\text{eredo}} = 2F \cdot \cos 30^\circ$$

$$F = k \frac{Q^2}{a^2}$$

(B)

$$F_{\text{eredo}} = 2k \frac{Q^2}{a^2} \cos 30^\circ = \sqrt{3} k \frac{Q^2}{a^2} = 6,23 \cdot 10^{-6} \text{ N}$$

2.)

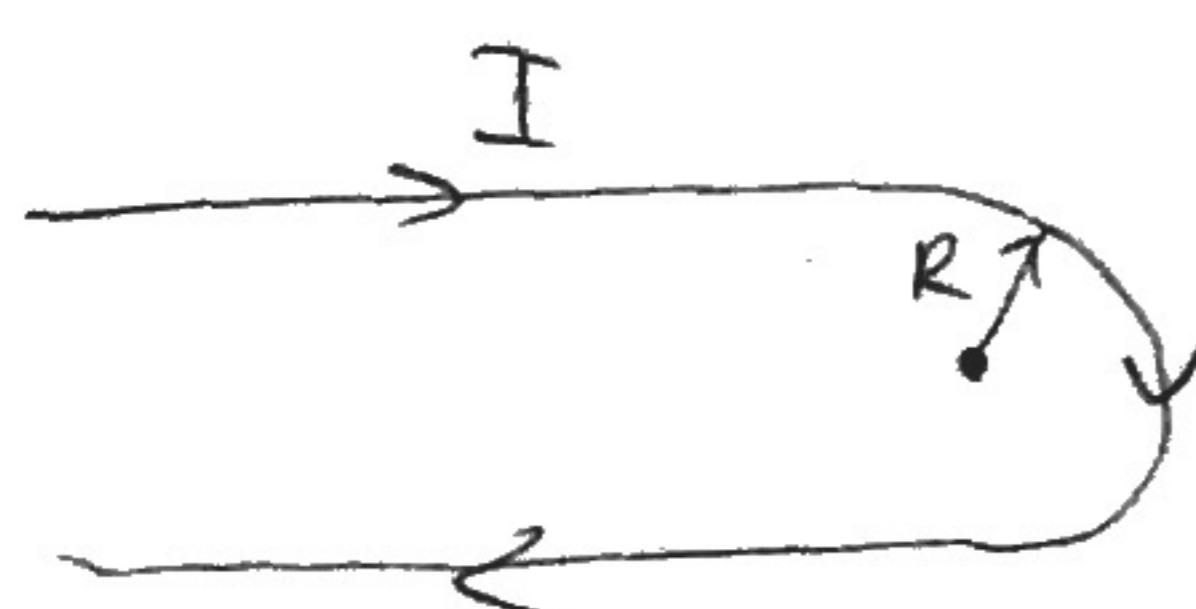
Az egyenes pálya feltétele:  $E = v \cdot B$ .

Az elektron sebessége:  $eU = \frac{1}{2}mv^2 \rightarrow v = \sqrt{\frac{2eU}{m}} = 5,93 \cdot 10^6 \frac{\text{m}}{\text{s}}$

$$E = 118,6 \text{ kV/m}$$

(A)

3.)

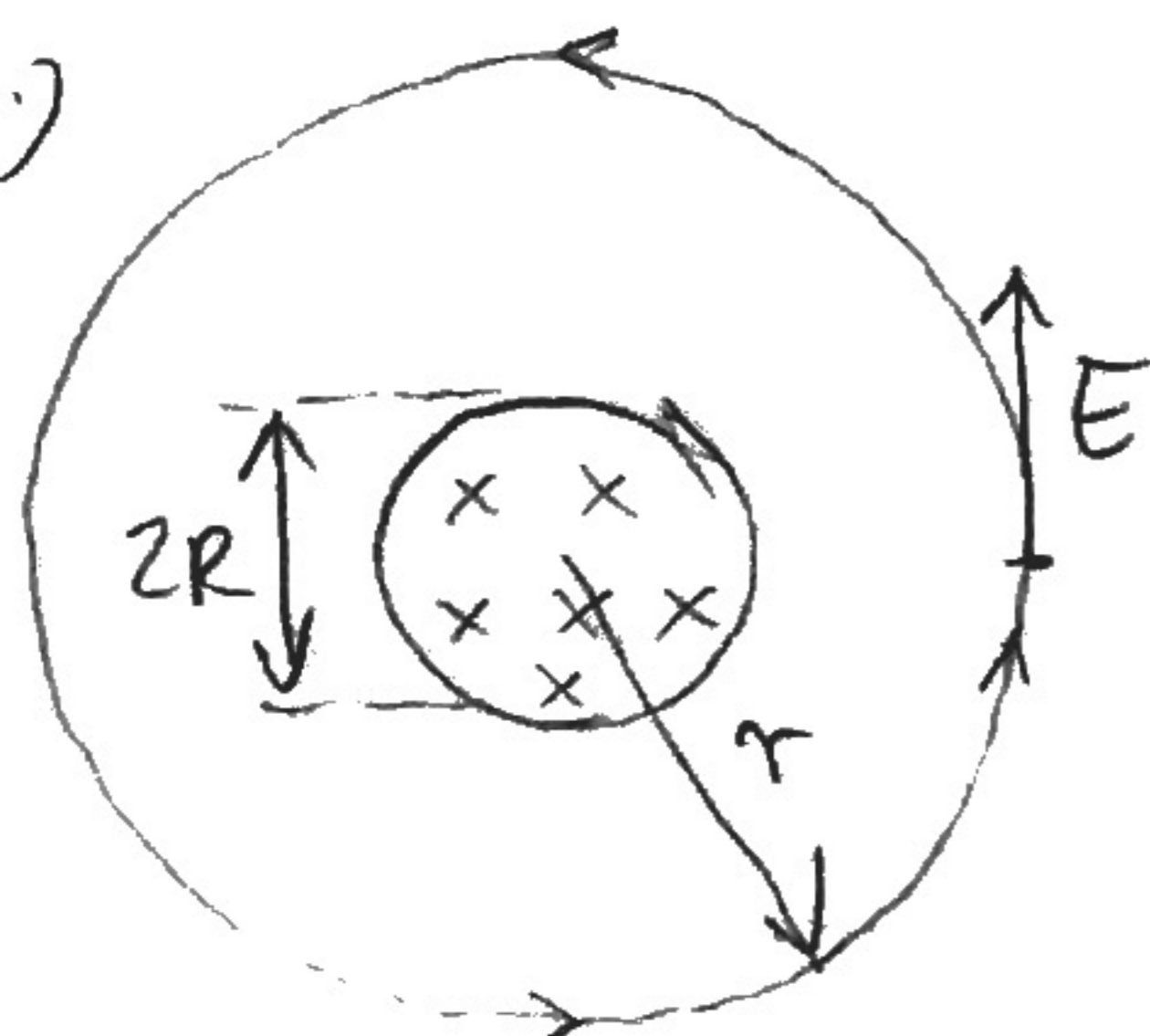


superpozíció: két félvégtelen vezeték és egy félkör.

$$B = \frac{\mu_0 I}{4\pi R} + \frac{\mu_0 I}{4\pi R} + \frac{\mu_0 I}{4R} = \frac{\mu_0 I}{4\pi R} (2 + \pi)$$

$$B = \frac{4\pi \cdot 10^{-7}}{4\pi} \cdot \frac{2}{0,1} \cdot (2 + \pi) = 10,3 \mu\text{T} \quad (C)$$

4.)



$$\underbrace{2\pi r \cdot E}_{U_i} = \underbrace{\pi R^2 \cdot \alpha}_{\frac{d\Phi}{dt}} \rightarrow E = \frac{\alpha}{2} \frac{R^2}{r}$$

$$E = 1,5 \frac{\text{mV}}{\text{m}}$$

(C)

5.) Kiemítés előtt:

$$I_{\text{tekercs}} = \frac{24\text{V}}{40\Omega} = 0,6 \text{ A}$$

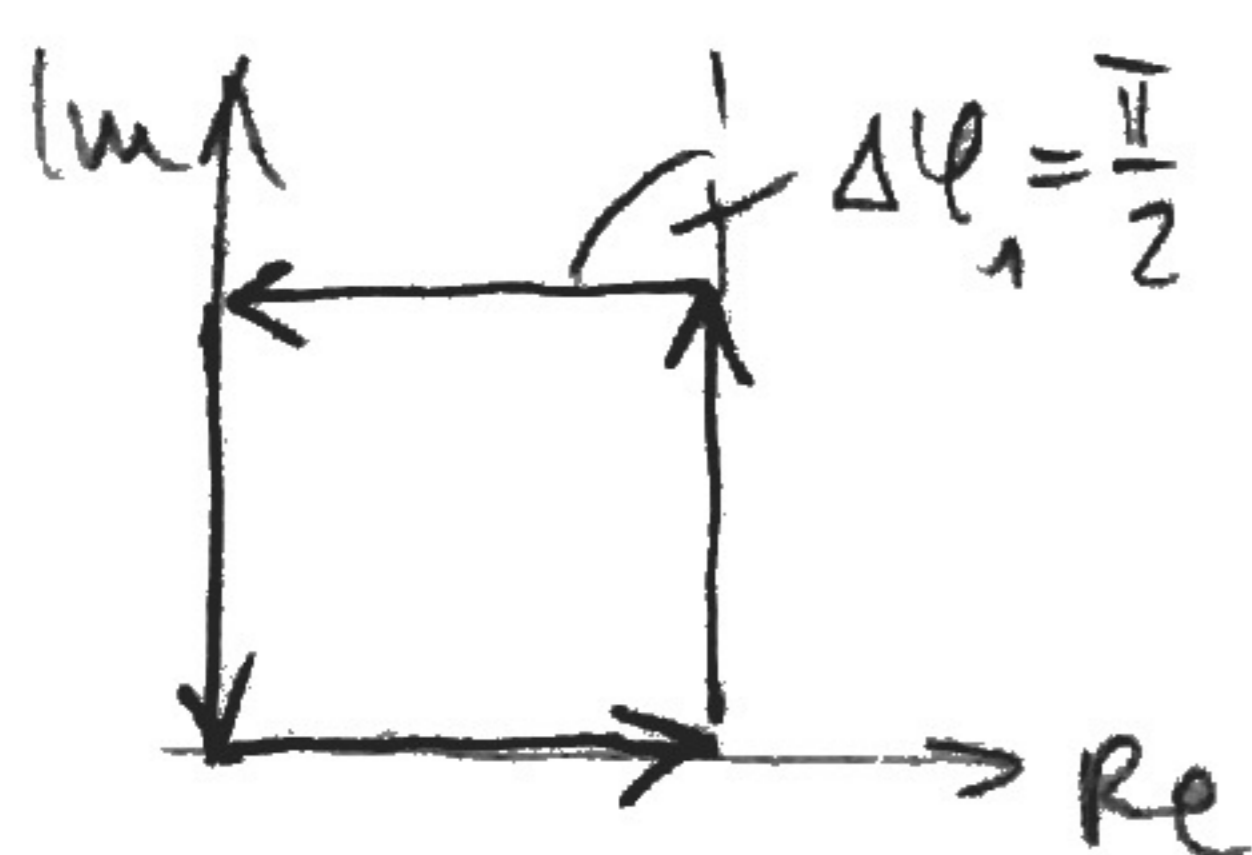
Kiemítés után:

$$I_{30\Omega} = I_{\text{tekercs}} = 0,6 \text{ A}, \quad U_{30\Omega} = 30\Omega \cdot 0,6 \text{ A} = 18 \text{ V}$$

(A)

6.)  $\underline{B}(y,t) = 2 \cdot 10^{-8} \underline{e}_x \sin(ky - \omega t)$  (D)

7.)



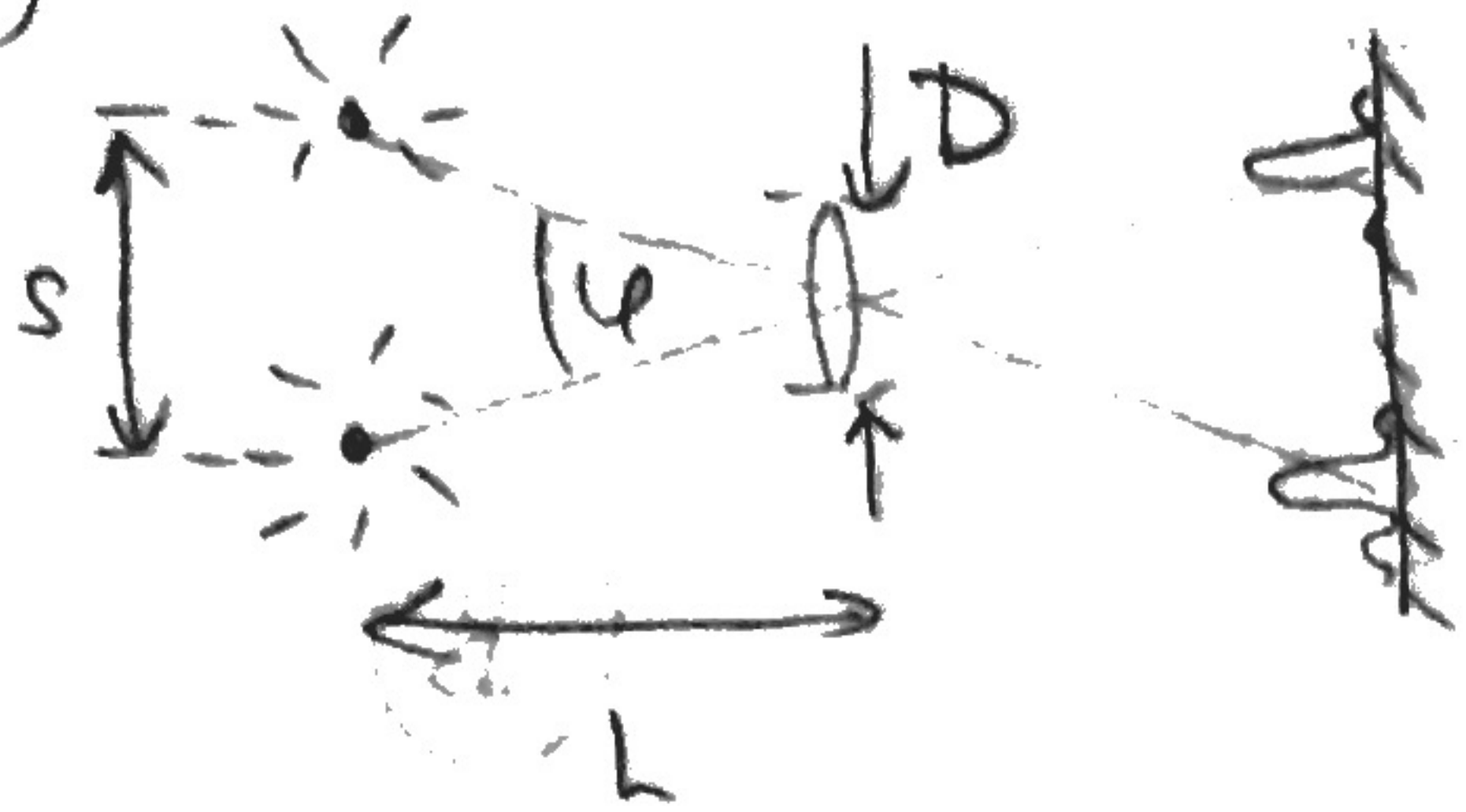
$$\Delta\varphi_1 = 2\pi \frac{d \sin \alpha}{\lambda} = \frac{\pi}{2} \rightarrow \sin \alpha = \frac{1}{4} \frac{\lambda}{d}$$

$$\Delta x \approx L \tan \alpha \approx L \sin \alpha = \frac{1}{4} \frac{\lambda L}{d}$$

$$\Delta x = 24 \text{ mm}$$

(B)

8.)



Rayleigh-kritérium:  $\psi > 1,22 \frac{\lambda}{D}$

$$\psi = \frac{s}{L} \rightarrow s \approx 1,22 \frac{\lambda L}{D}$$

$$s = 51,5 \text{ m. } \textcircled{B}$$

9.) A fókustávolság 4 egységnyi.

$\textcircled{B}$

$\textcircled{A}$

$\textcircled{C}$

$\textcircled{D}$

$\textcircled{A}$

$\textcircled{D}$

$\textcircled{A}$

