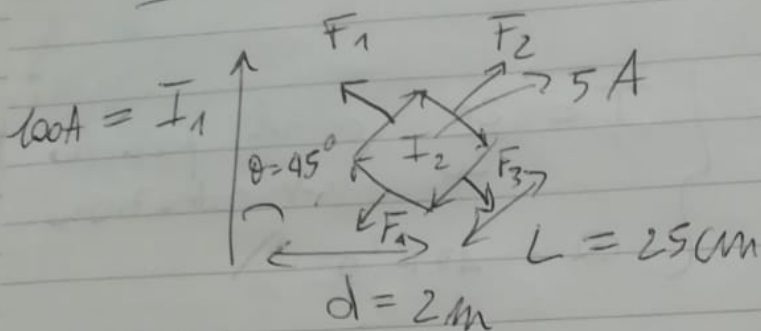


# ESERCIZIO 3 - 10/09/2021



Filo e spira sullo stesso piano

$\vec{dF}_1 \propto \vec{B}(x)$   
 $\vec{dl}_1$   
 Sino  $\vec{B}(x)$  il campo sul lato 1 dovuto alle correnti  $I_1$

$$(d\vec{F}_1)_x = (I_2 \vec{dl}_1 \times \vec{B}(x)) (-\sin\theta) = \frac{dl_1}{dx}$$

$$= I_2 \frac{dx}{\cos\theta} \frac{\mu_0 I_1}{2\pi x} \sin\theta \quad \left( \vec{l}_1 \perp \vec{B}_1 \text{ quindi } \kappa = \vec{l}_1 \cdot \vec{B}_1 \right)$$

$$(d\vec{F}_1)_x = (d\vec{F}_4)_x \quad (d\vec{F}_1)_y + (d\vec{F}_4)_y = 0$$

$$(d\vec{F}_2)_x = (I_2 \vec{dl}_2 \times \vec{B}(x)) \cos\theta =$$

$$= I_2 \left( \frac{dx}{\sin\theta} \right) \left( \frac{\mu_0 I_1}{2\pi x} \right) \cos\theta \quad (d\vec{F}_2)_y + (d\vec{F}_3)_y =$$

$$F_x^{\text{Tot}} = -2 \int_{d-L\cos\theta}^d \frac{\mu_0 I_1 I_2}{2\pi x} \tan\theta dx + 2 \int_{d+L\cos\theta}^d \frac{\mu_0 I_1 I_2}{2\pi x} \tan\theta dx =$$

$$= \frac{\mu_0 I_1 I_2}{\pi} \left[ \ln\left(1 + \frac{L}{d} \cos\theta\right) \frac{1}{\tan\theta} + \ln\left(1 - \frac{L}{d} \cos\theta\right) \tan\theta \right]$$

$$= \frac{\mu_0 I_1 I_2}{\pi} \ln\left(1 - \frac{L^2}{d^2}\right) = -1.6 \times 10^{-6} \text{ N}$$