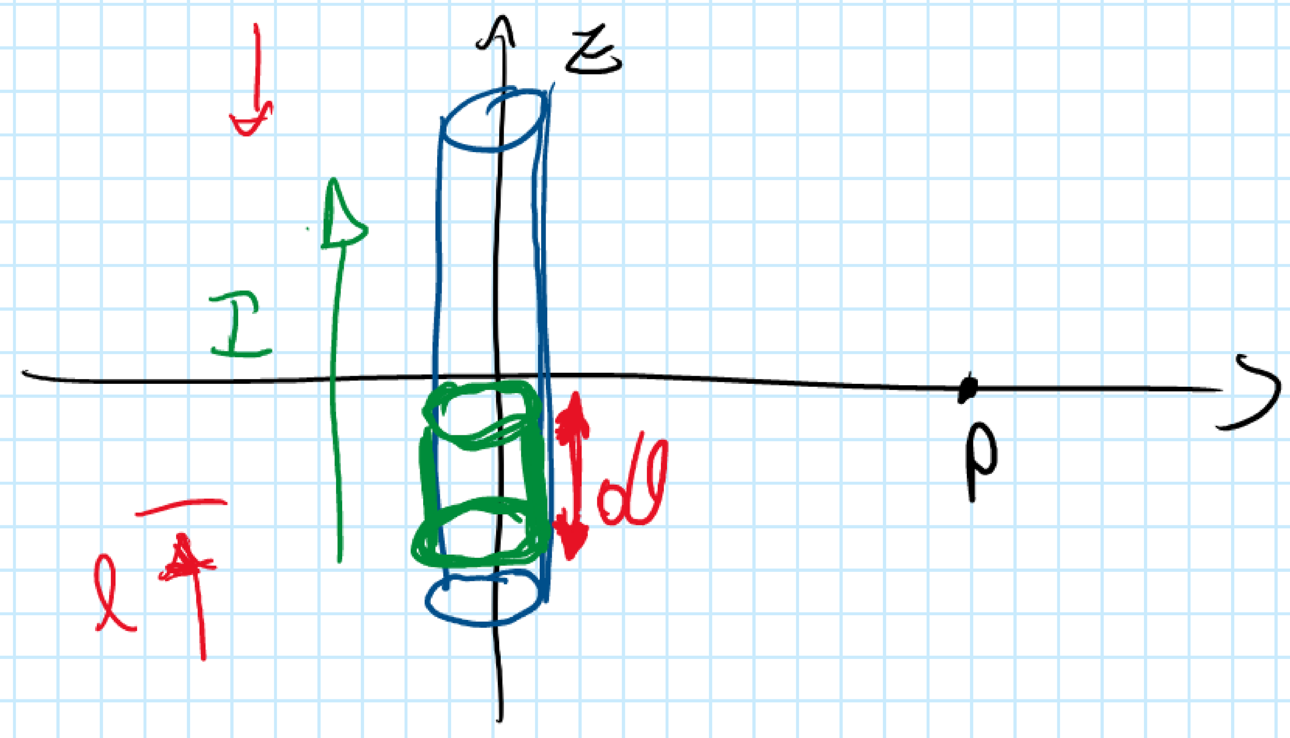
PER RICAVARE QUESTA LEGGE ANDIAMO A CONSIDERARE UN CONDUTTORE DI FORMA CILINDRICA




$$H = \frac{I}{4\pi}\int \frac{dl \times \hat{r}}{R^2}$$

$$dl = \hat{z}\, dz$$

$$dl \times \hat{r} = (\hat{z} \times \hat{r})\, dz = \hat{\phi} \sin\theta\, dz$$

$$H = \frac{I}{4\pi}\int_{-\frac{l}{2}}^{\frac{l}{2}} \frac{\phi \sin\theta}{R^2}\, dz$$

$$r = R\sin\theta \Rightarrow R = \frac{r}{\sin\theta}$$

$$r = -z\, \mathrm{Tg}\,\theta \Rightarrow z = -\frac{r}{\mathrm{Tg}\,\theta} \Rightarrow$$

$$\Rightarrow dz = \frac{r}{\sin^2\theta}\, d\theta$$

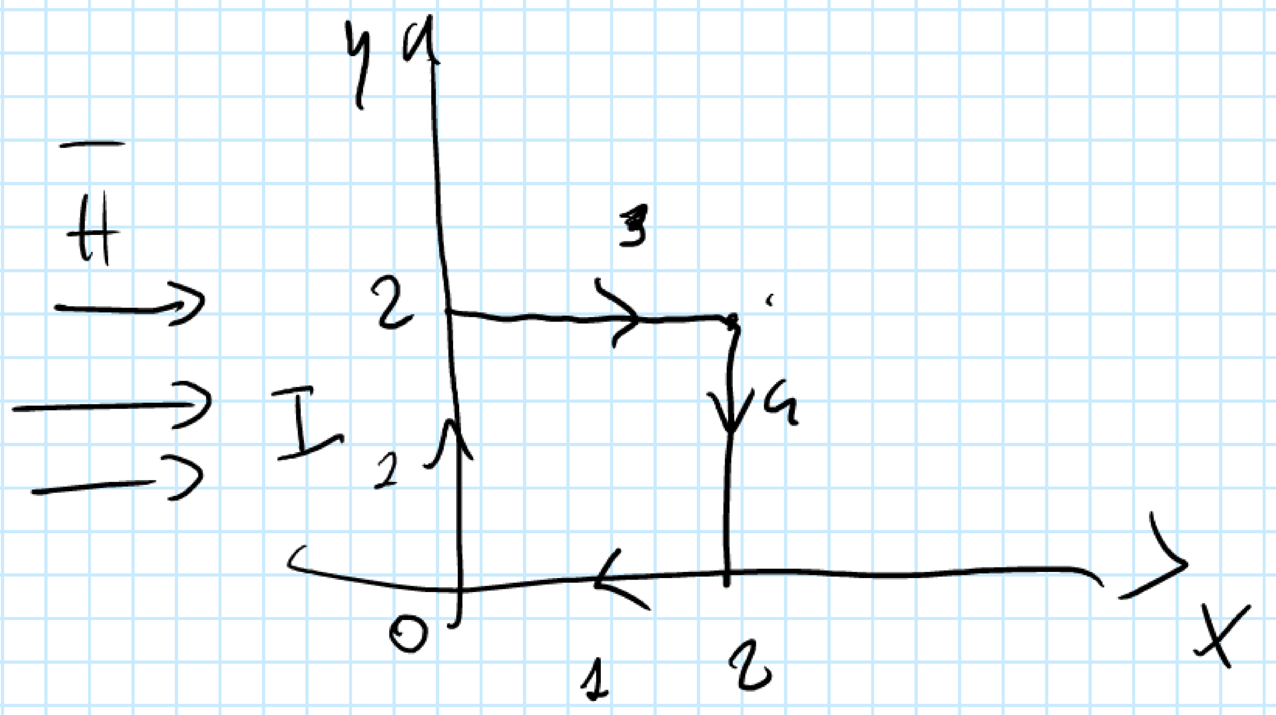
$$\bar{H} = \hat{\phi}\, \frac{I}{4\pi r}\int_{\theta_1}^{\theta_2} \frac{\sin\theta}{r^2}\, \cancel{\sin^2\theta} \cdot \frac{r}{\cancel{\sin^2\theta}}\, d\theta \Rightarrow H = \hat{\phi}\, \frac{I}{4\pi r}\int_{\theta_1}^{\theta_2} \sin\theta\, d\theta$$

$$= \hat{\phi}\, \frac{I}{4\pi r}(\cos\theta_1 - \cos\theta_2) = \hat{\phi}\, \frac{I}{2\pi R} \Rightarrow I = |H| \cdot 2\pi r \Rightarrow I = \oint H \cdot dl$$

LEGGE DI AMPERE

## ESERCIZIO

ASSEGNATO $\bar{H} = \hat{x}\, 3y^2$ CALCOLARE LA CORRENTE CHE ATTRAVERSA LA SPIRA QUADRATA.




$$I = \oint H \cdot dl \Rightarrow$$

$$\Rightarrow 1 \int_0^2 \hat{x}\, 3y^2 \cdot -\hat{x}\, dx = -6 \cdot 0 = 0$$

$y = 0$

$$4 \int_2^0 \hat{x}\, 3y^2 \sim \hat{y}\, dy = 0 \qquad 2 \int_0^2 \hat{x}\, 3y^2\, \hat{y}\, dy = 0$$

$$I = 24 \qquad 3 \int_0^2 \hat{x}\, 3y^2\, \hat{x}\, dx = 3 \cdot 2^2 \cdot 2 = 24$$

## ESERCIZIO

UN CONDUTTORE CILINDRICO DI RAGGIO $r = 10^{-2}$ m È SOTTOPOSTO ALL'AZIONE DI UN CAMPO MAGNETICO $\bar{H} = (4,77 \cdot 10^4)\left(\frac{r}{2} - \frac{r^2}{3 \cdot 10^{-2}}\right)\hat{\phi}$

$I = ?$

$$I = \oint H \cdot dl \Rightarrow \int_0^{2\pi} (4,77 \cdot 10^4)\left(\frac{r}{2} - \frac{r^2}{(3 \cdot 10^{-2})}\right) \hat{\phi}\, \hat{\phi}\, r\, d\phi \Rightarrow$$

$$dl = \hat{\phi}\, r\, d\phi$$

$$\Rightarrow (4,77 \cdot 10^4)\, \frac{10^{-2}}{2} - \frac{10}{(3 \cdot 10^{-2})}\, 10^{-2} \cdot 2\pi = 4,92\, (A)$$