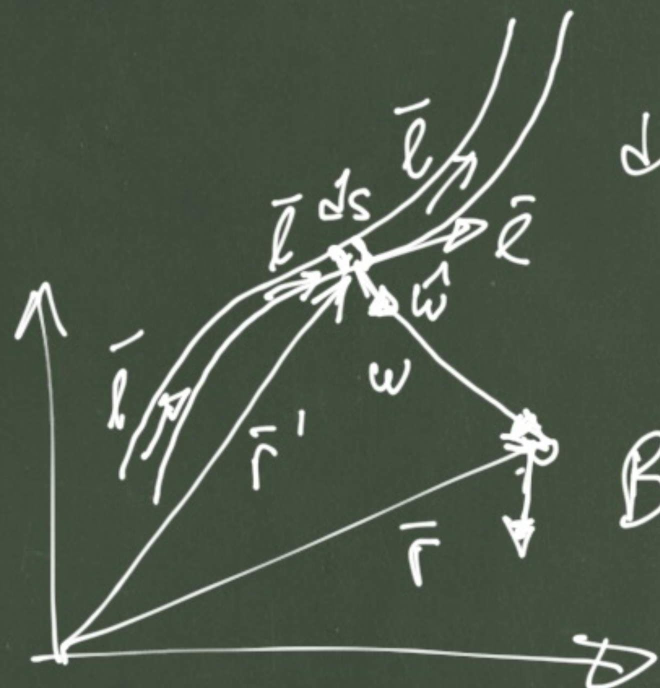
Biot-Savart → sovrapposizione

Ampere → "analogo" di Gauss



$$d\bar{B}(\bar{r}) = \frac{\mu_0}{4\pi}\frac{I}{w^2}\, d\bar{s} \times \hat{w} = \frac{\mu_0}{4\pi}\frac{I}{w^2}\, ds\, \hat{l} \times \hat{w}$$

$$B(\bar{r}) = \frac{\mu_0}{4\pi} I \int ds\, \hat{l} \times \hat{w}$$

$$B(r) = \frac{\mu_0}{4\pi} I \int ds \frac{\hat{l} \times \hat{w}}{w^2} = \frac{\mu_0}{4\pi} \int dV \frac{\vec{J} \times \hat{w}}{w^2}$$

$$I\,ds\,\hat{l} = \vec{j}\,dA\,ds$$

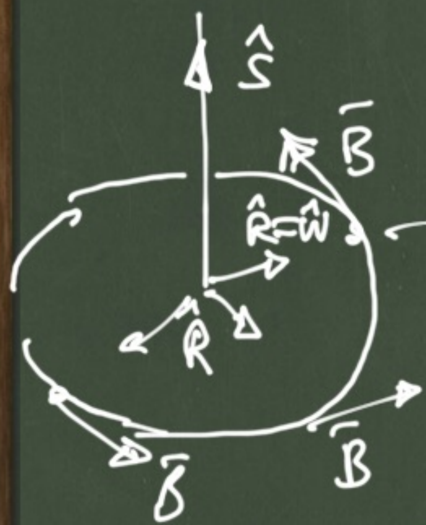
$$\vec{J} = nq\bar{v} \qquad d\bar{B} = \frac{\mu_0}{4\pi} nq \frac{\bar{v} \times \hat{w}}{w^2} dV$$

$$B = \frac{\mu_0}{4\pi} q \frac{\bar{v} \times \hat{w}}{w^2} \underbrace{n \int dV}_{nV = N} \rightarrow \bar{B}_1 = \frac{\mu_0 q}{4\pi} \frac{\bar{v} \times \hat{w}}{w^2}$$

$$\vec{E} = \frac{q \quad \hat{w}}{4\pi\varepsilon_0 w^2}$$

$$\boxed{\bar{B}_1 = \mu_0 \varepsilon_0 (\vec{v} \times \vec{E})}$$

$$\mu_0 \varepsilon_0 = 1/c^2$$



$$dB = \frac{\mu_0}{4\pi} I \frac{ds \sin\theta}{r^2}$$

$$B = \frac{\mu_0 I}{4\pi}\int_{-\infty}^{+\infty} \frac{\sin\theta \, ds}{r^2}$$

$$R^2+s^2=r^2$$

$$r \sin(\pi-\theta) = R$$

$$r \sin\theta$$

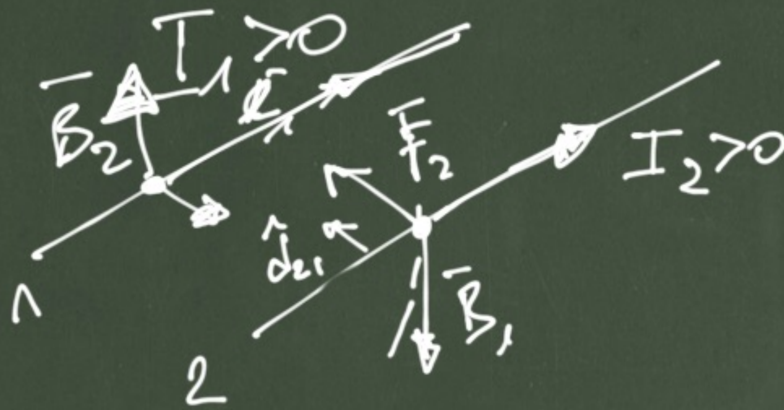
$$= 2\frac{\mu_0 I_0}{4\pi} R \int_0^{\infty} \frac{ds}{(s^2+R^2)^{3/2}}$$

$$\sin\theta = \frac{R}{r} = \frac{R}{\sqrt{R^2+s^2}}$$

$$B =$$

$$\frac{\mu_0 I}{2\pi} R \int_0^\infty \frac{ds}{(s^2+R^2)^{3/2}} = \frac{\mu_0 I R}{2\pi} \left. \frac{s}{R^2\sqrt{s^2+R^2}} \right|_0^\infty$$

$$B = \frac{\mu_0 I}{2\pi R} \quad (\hat{S} \times \hat{R})$$



$$\bar{F}_2 = I_2 \bar{L} \times \bar{B}_1$$

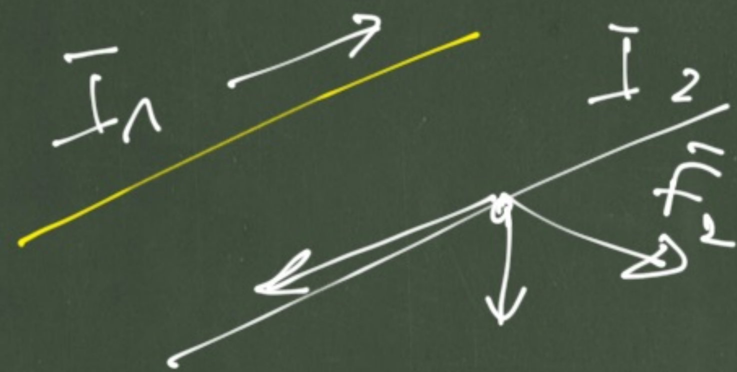
$$= I_2 L \frac{\mu_0 I_1}{2\pi d} \hat{d}_{12}$$

$$= \hat{d}_{12} \frac{I_1 I_2 L}{d} \frac{\mu_0}{2\pi}$$

$$\bar{F}_1 = -\hat{d}_{21} I_1 L B_2$$

$$= -\hat{d}_{21} I_1 L \frac{I_2}{2\pi} \frac{\mu_0}{d} = -\hat{d}_{21} \frac{\mu_0}{2\pi} \frac{I_1 I_2}{d} L$$

$$\bar{F}_1 = -\bar{F}_2$$



correnti uguali si attraggono

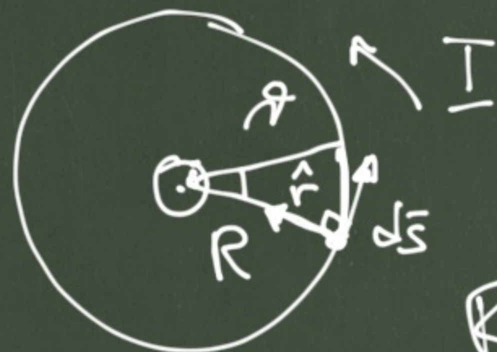
opposte si respingono

$$\mu_0 = 4\pi\, 10^{7}\, \frac{T\,m}{A}$$ permeab. magnetica del vuoto

$$1\,H = \frac{T\,m}{A}$$ → induttanza

Solenoide:

3 passi



$$dB_z = \frac{\mu_0}{4\pi} I \frac{ds}{R^2} = \frac{\mu_0}{4\pi} I \frac{d\theta}{R}$$

$$B_z = \frac{\mu_0 I}{4\pi R} \int_0^{2\pi} d\theta$$

$$\boxed{B_z = \frac{\mu_0 I}{2R}}$$

Campo al centro di 1 spira

1