

Biot-Savart \rightarrow sompositiva
 Ampere \rightarrow "analogo" di far

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

$$= \frac{\mu_0}{4\pi} \frac{I}{r^2} ds \hat{l} \times \hat{w}$$

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


$$\begin{aligned}
 \vec{B}(\vec{r}) &= \frac{\mu_0}{4\pi} \int d\vec{s} \frac{\hat{l} \times \hat{w}}{w^2} = \frac{\mu_0}{4\pi} \int dV \frac{\vec{J} \times \hat{w}}{w^2} \\
 \int d\vec{s} \hat{l} &= \vec{J} dA ds
 \end{aligned}$$

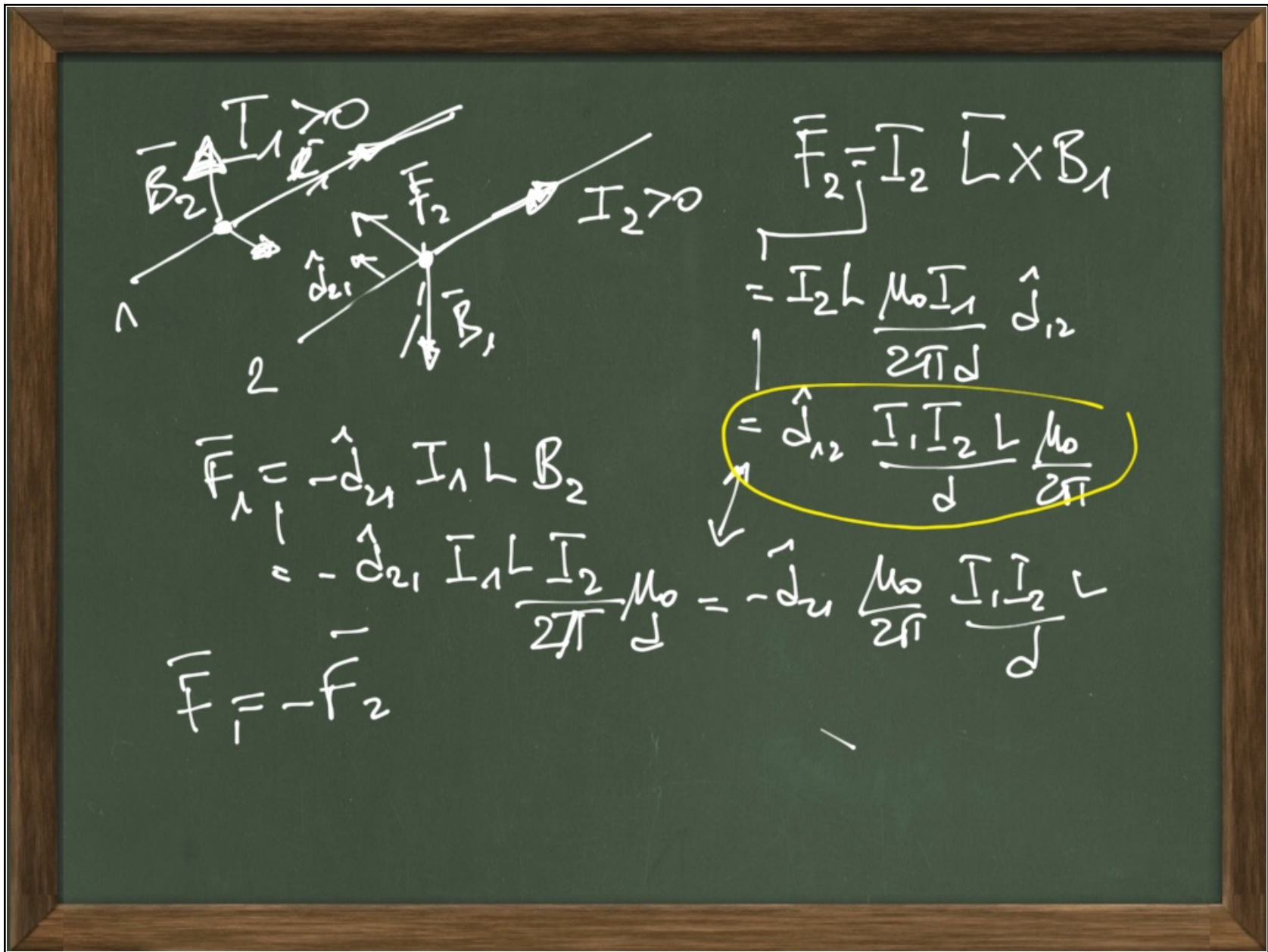
$$\begin{aligned}
 \vec{J} &= nq\vec{v} & \oint \vec{B} &= \frac{\mu_0}{4\pi} nq \oint \frac{\vec{v} \times \hat{w}}{w^2} dV \\
 \vec{B} &= \frac{\mu_0}{4\pi} q \frac{\vec{v} \times \hat{w}}{w^2} \underbrace{n \int dV}_V=N & \rightarrow \vec{B}_1 &= \frac{\mu_0 q}{4\pi} \frac{\vec{v} \times \hat{w}}{w^2} \\
 \vec{E} &= \frac{q}{4\pi\epsilon_0 w^2} & \boxed{\vec{B}_1} &= \mu_0 \epsilon_0 (\vec{v} \times \vec{E}) \\
 & & & \mu_0 \epsilon_0 = 1/c^2
 \end{aligned}$$

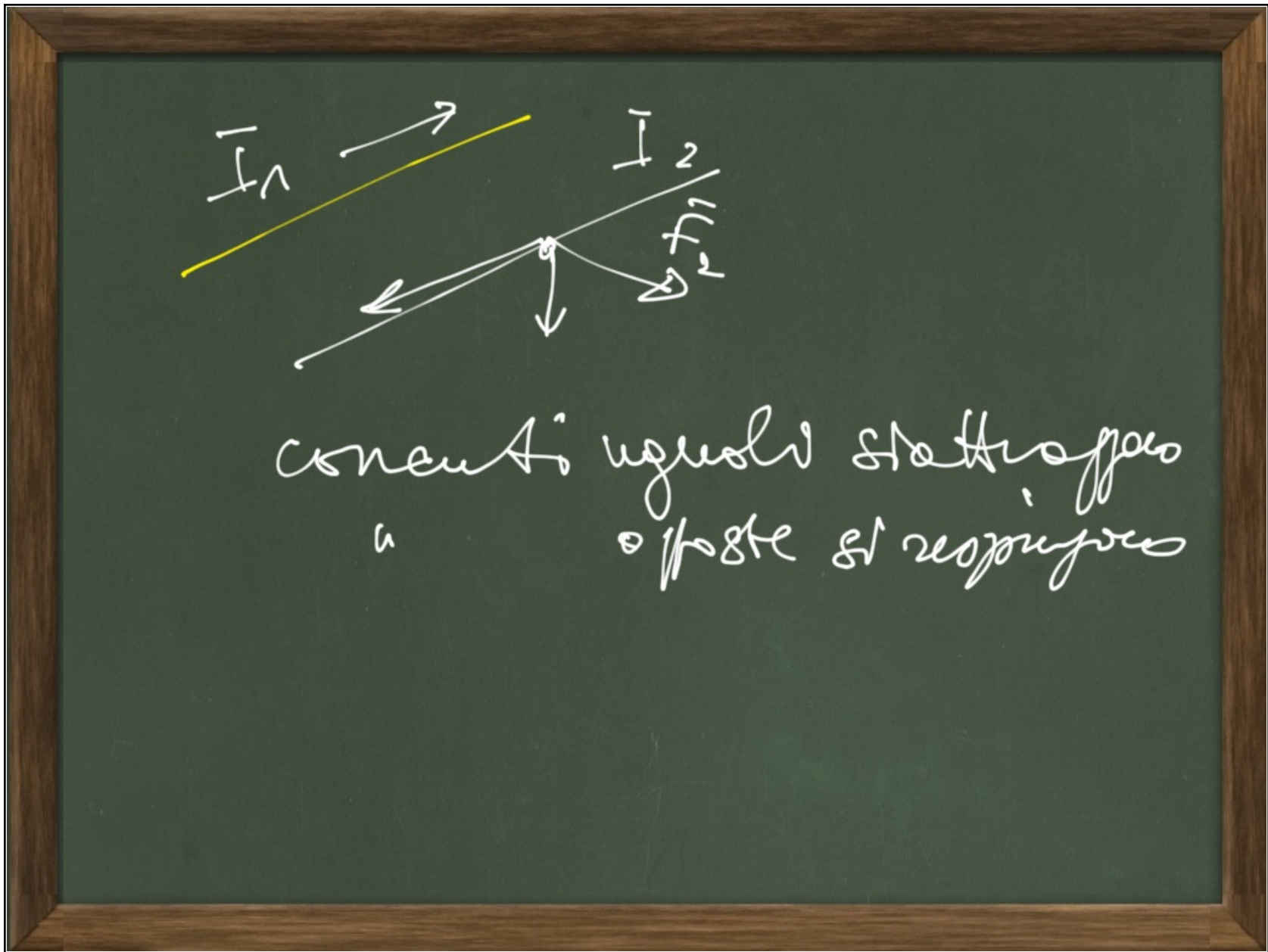
The image shows a handwritten derivation on a chalkboard for the magnetic field of a current loop. The derivation includes the following elements:

- Diagram 1 (Top Left):** A circular current loop of radius R with current I flowing out of the page. A point P is on the axis at a distance s from the center. The magnetic field vector \vec{B} is shown at P , and the distance from the center to P is $\sqrt{R^2 + s^2}$.
- Diagram 2 (Top Middle):** A right-angled triangle representing the geometry of a current element ds on the loop. The hypotenuse is the distance r from ds to point P . The angle between ds and r is θ . The horizontal distance from the center to the projection of P is R . The relationship $R^2 + s^2 = r^2$ is noted.
- Equation 1:**
$$dB = \frac{\mu_0 I}{4\pi} \frac{ds \sin \theta}{r^2}$$
- Equation 2:**
$$B = \frac{\mu_0 I}{4\pi} \int_{-\infty}^{+\infty} \frac{\sin \theta ds}{r^2}$$
- Equation 3:**
$$r \sin(\pi - \theta) = R$$
- Equation 4:**
$$r \sin \theta = R$$
- Equation 5:**
$$\sin \theta = \frac{R}{r} = \frac{R}{\sqrt{R^2 + s^2}}$$
- Equation 6:**
$$= \frac{2\mu_0 I_0 R}{4\pi} \int_0^{\infty} \frac{ds}{(s^2 + R^2)^{3/2}}$$
- Diagram 3 (Bottom Left):** A small geometric diagram showing a right-angled triangle with sides s , R , and hypotenuse r .
- Diagram 4 (Bottom Middle):** A diagram showing the relationship between the distance s along the axis and the distance w from the center to the projection of the point P .

$$B = \frac{\mu_0 I_0}{2\pi} R \int_0^{\infty} \frac{ds}{(s^2 + R^2)^{3/2}} = \frac{\mu_0 I R}{2\pi} \left. \frac{s}{R^2 \sqrt{s^2 + R^2}} \right|_0^{\infty}$$

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




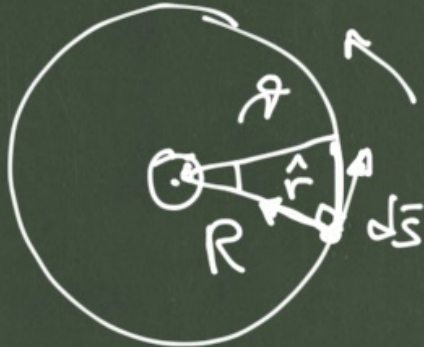


$$\mu_0 = 4\pi \cdot 10^7 \frac{\text{Tm}}{\text{A}}$$

permeab.
magnética
del vuoto

$$\Delta H = \frac{\text{Tm}}{\text{A}} \rightarrow \text{insuficiente}$$

Solenoides:
3 puros



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

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

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

Campo
 el centro
 de la espira

