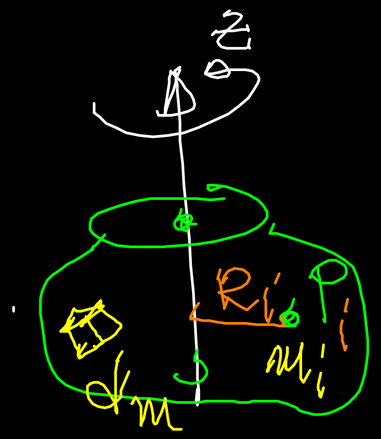
MOMENTO DI INERZIA

$$K = \frac{1}{2} I_z \omega_z^2$$

ROT. DI CORPO RIGIDO INTORNO A Z FISSO

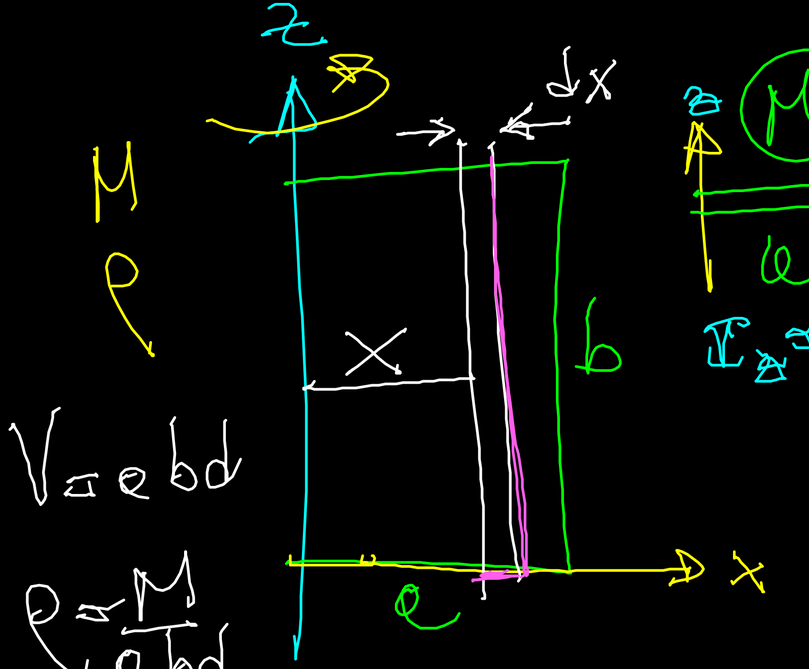


$$I_z = \sum_{i=1}^{N} m_i R_i^2$$

CASO DISCRETO

$$I_z = \int_{\text{CORPO}} R^2 \, dm = \int_{\text{Vol. del corpo}} \rho R^2 \, dV$$

ESEMPIO DI CALCOLO



I_z della porta (omogenea) sottile

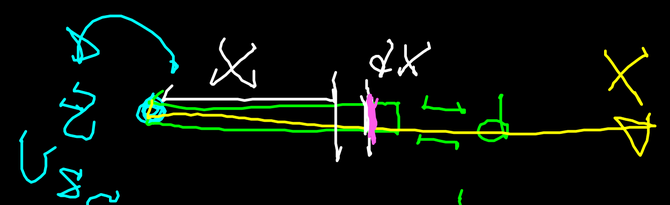
$$I_z = \int_{Vol\ del\ corpo} \rho R^2 dV \quad dV = b\,d\,dx \quad R = x$$

$$I_z = \int_0^e \rho b d x^2 dx$$

$$I_z = \rho b d \int_0^e x^2 dx =$$

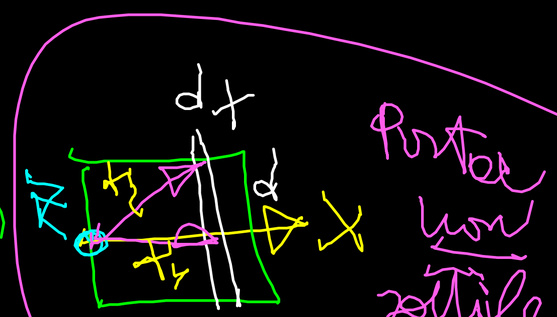
$$= \rho b d \frac{e^3}{3} =$$

$$I_z = \frac{M}{ebd} bd \frac{e^3}{3} = \frac{Me^2}{3}$$

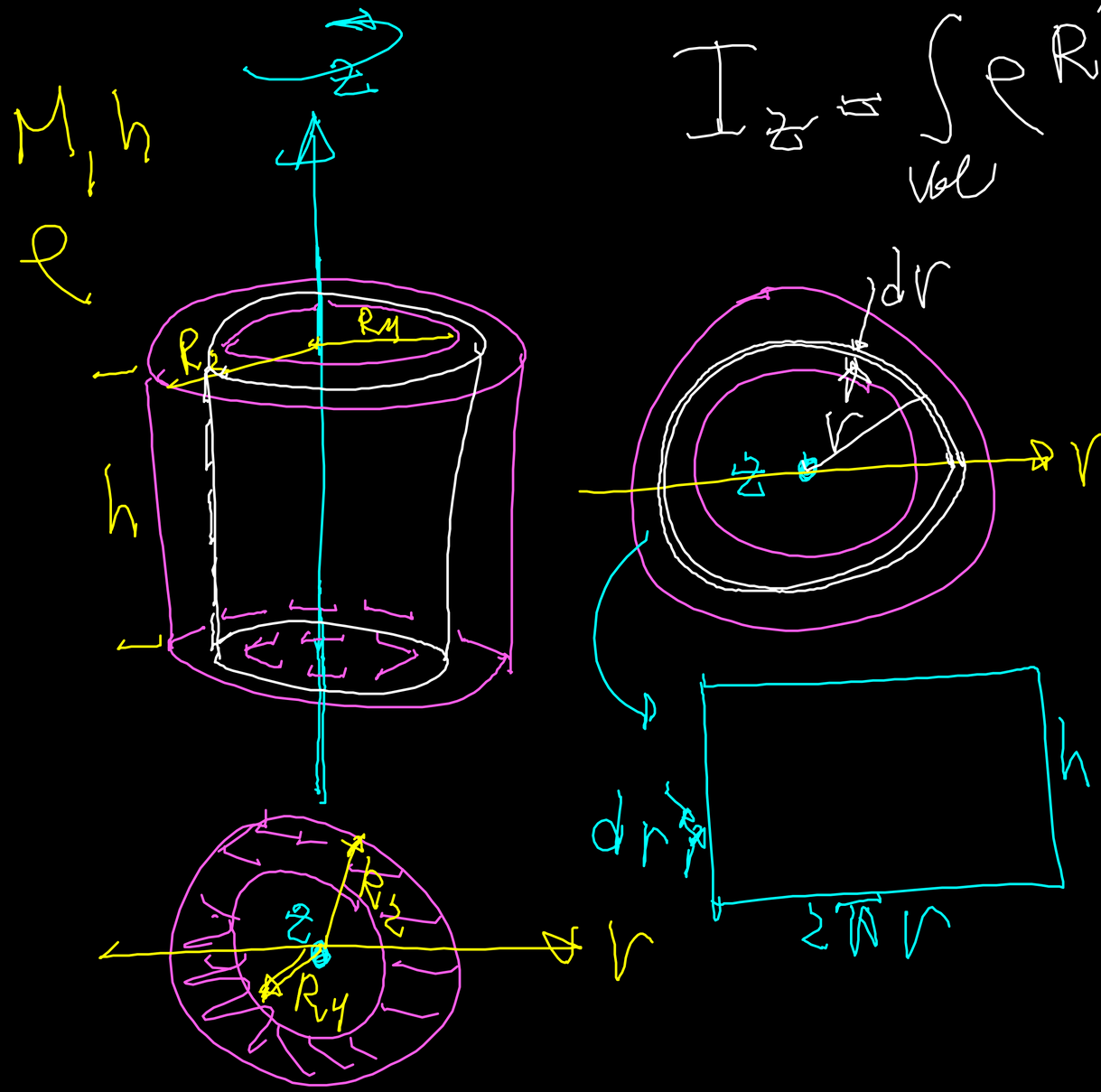


$d \ll a, b$

porta sottile



ESEMPIO
MOM. DI INERZIA DEL CILINDRO (omogeneo)



$$I_z = \int_{Vol} \rho R^2 dV$$

$$dV = 2\pi h r dr$$

$$R^2 = r^2$$

$$I_z = \int_{Vol} \rho 2\pi h r^3 dr =$$

$$= 2\pi h \rho \int_{R_1}^{R_2} r^3 dr = \frac{2\pi h \rho}{4}\left(R_2^4 - R_1^4\right)$$

$$\rho = \frac{M}{Vol} = \frac{M}{\pi R_2^2 h - \pi R_1^2 h}$$

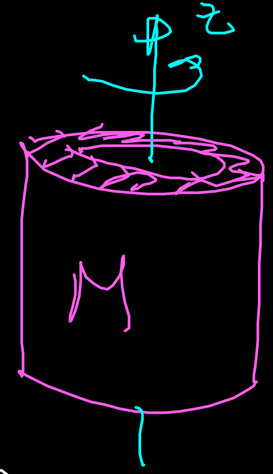
$$I_z = \frac{\pi h \rho}{2}\left(R_2^4 - R_1^4\right) = \frac{\pi h M \left(R_2^4 - R_1^4\right)}{2 \left(R_2^2 - R_1^2\right)\pi h} =$$

$$\rho = \frac{M}{\pi h \left(R_2^2 - R_1^2\right)}$$

$$= \frac{M}{2} \frac{\left(R_2^2 - R_1^2\right)\left(R_2^2 + R_1^2\right)}{\left(R_2^2 - R_1^2\right)} =$$

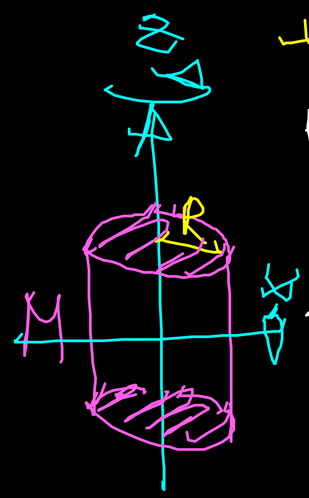
CIL. CAVO

$$I_z = \frac{M}{2}\left(R_2^2 + R_1^2\right)$$



NB

$I_z \neq I_x$

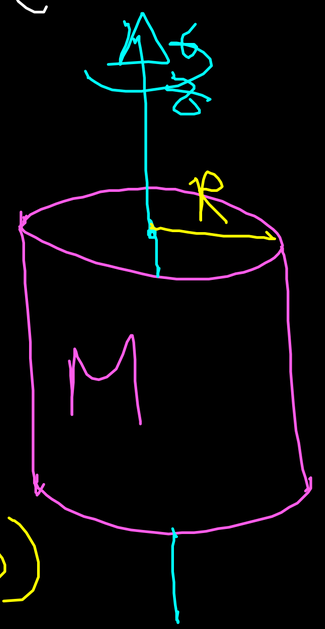


$R_1 \to 0$

$R_2 \to R$

$$I_z = \frac{1}{2} M R^2$$

CIL. PIENO (DISCO)



$R_1 \to R$

$R_2 \to R$

$$I_z = M R^2$$

STRATO CILIND. SOTTILE