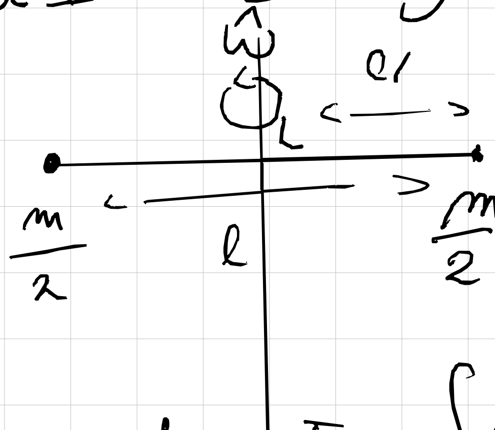
Traagheidsmoment I: $I = \int |\hat{\omega} \times \vec{r}|^2 \, dm$

(1)



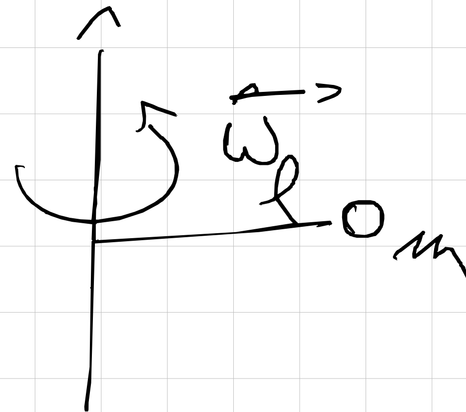
$\Rightarrow \sin\theta = 1$ dus $I = \int r^2 \, dm$ $\to$ cte

$= 2\left(\frac{m}{2}\left(\frac{l}{2}\right)^2\right) = \frac{ml^2}{4}$

$K = \frac{1}{2} I \omega^2$

$= \frac{1}{8} m l^2 \omega^2$

(2)

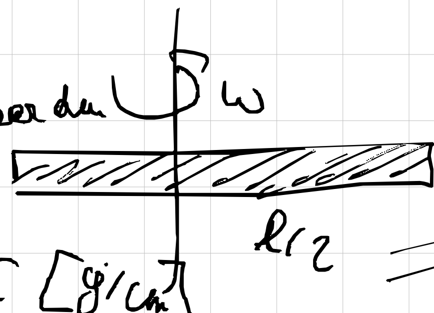


$$I = \int r^2 \, dm = l^2 m$$

$$K = \frac{1}{2} l^2 m \omega^2$$

(3)

verwaarloosbaar dm



$\Rightarrow \rho = C \; [g/cm]$

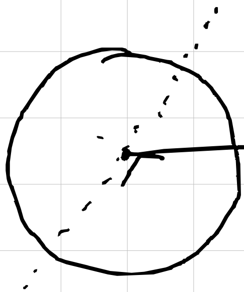
$m = \rho l$

$$I = \int r^2 \, dm$$

$$dm = \rho \, dx$$

$$I = 2\rho \int_0^{l/2} x^2 \, dx = \frac{2}{3} \rho \frac{l^3}{8} = \frac{\rho l^3}{12} = \frac{m l^2}{12}$$

③



$x n \theta = 1$;

$$I = \int r^2 \, dm$$

$$dm = \rho \, dA$$

$$dm = \rho \, 2\pi r \, dr$$

$$A = \pi r^2$$

$$\frac{dA}{dr} = 2\pi r$$

$$dA = 2\pi r \, dr$$

$$I = \int_0^R r^2 \rho \, 2\pi r \, dr$$

$$m = \int_0^R \rho \, dA$$

$$= 2\pi\rho \int_0^R r \, dr$$

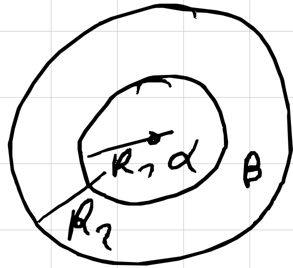
$$= \pi \rho R^2$$

$$I = 2\pi\rho \int_0^R r^3 \, dr$$

$$I = 2\pi\rho \left[\frac{r^4}{4} \right]_0^R$$

$$I = \pi \rho \frac{R^4}{2} = \frac{m R^2}{2}$$

④



$\vec{\omega} \perp$ schijf

$\rho\ [g/cm^2]$

$$I_\beta = \int r^2\, dm$$

$\alpha + \beta = tot$

$$M_\beta = \pi\rho\,(R_2^2 - R_1^2)$$

$$\rightsquigarrow \quad I_{tot} = I_\beta + I_\alpha$$

$$I_\beta = \frac{\pi}{2}\rho R_2^4 - \frac{\pi}{2}\rho R_1^4$$

$$= \frac{\pi}{2}\rho\,(R_2^2 - R_1^2)(R_2^2 + R_1^2)$$

$$= \frac{M_\beta}{2}\,(R_1^2 + R_2^2)$$