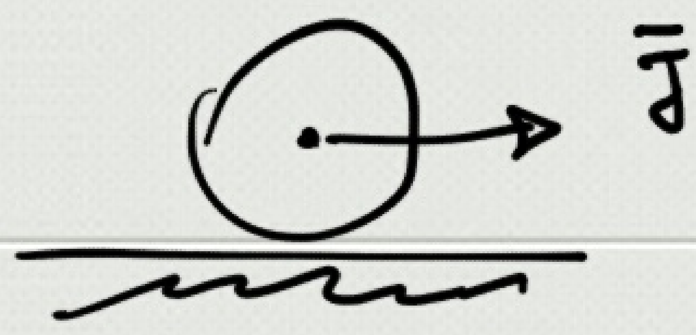


$m = 0.05\ kg$

$R = 0.02\ m$

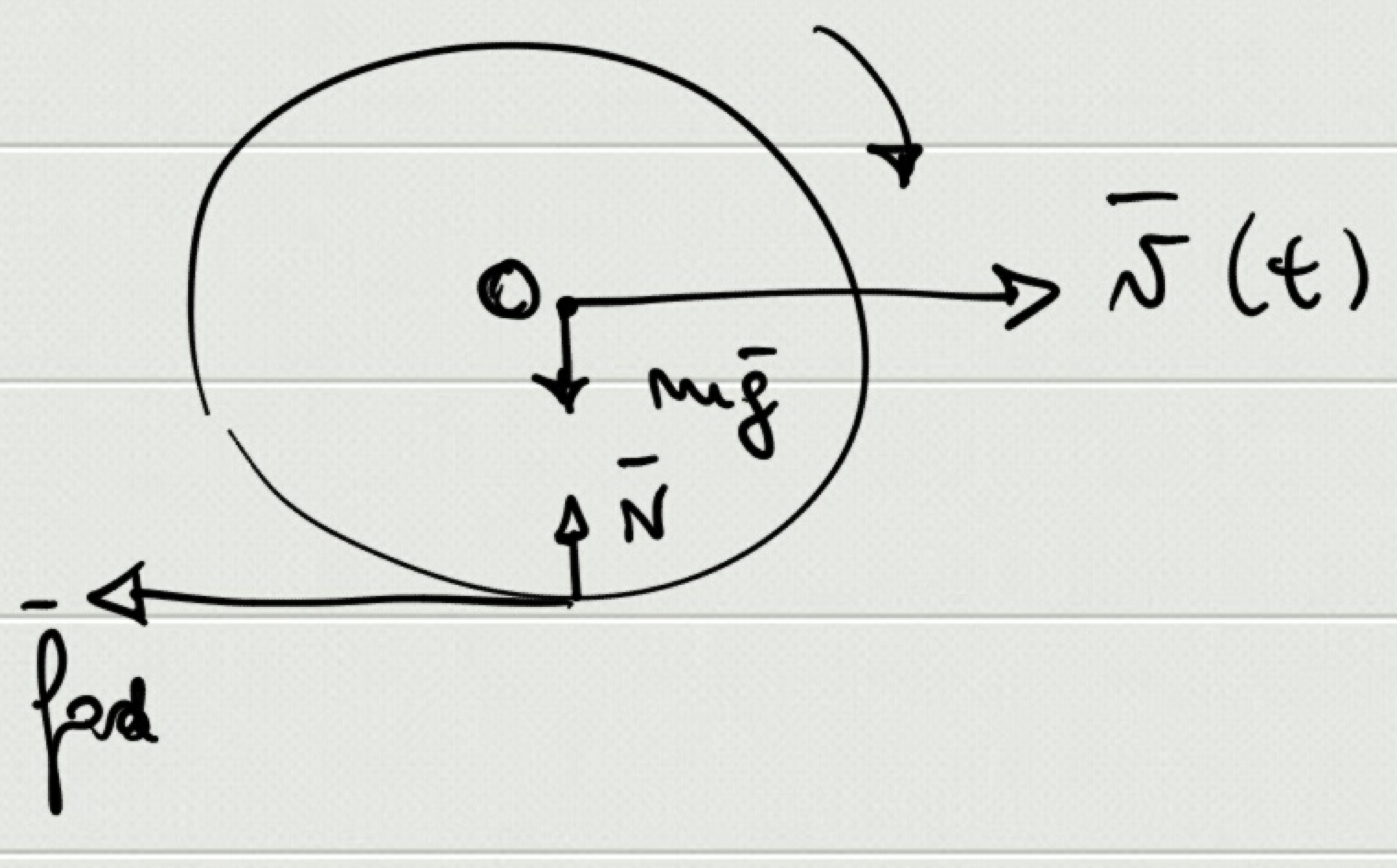
$J = 0.7\ Ns$

$\mu_d = 0.2$

strisciamento per t_1

poi puro rotol.

$$\bar J = \Delta \bar p = \bar p_f - \bar p_i = m \bar v_0 \Rightarrow v_0 = \frac{J}{m} = 14\ m/s$$



$$\bar f_{ad} = -\mu_d N \bar u_v$$

$$\Rightarrow \begin{cases} -\mu_d \cancel{m} g = \cancel{m}\, a_{CM} \Rightarrow \boxed{a_{CM} = -\mu_d g} \\ R f_{ad} = I_0 \alpha \Rightarrow \cancel{R} \mu_d \cancel{m} g = \frac{2}{5} \cancel{m} R^{\cancel{2}} \alpha \end{cases}$$

$$\Rightarrow \boxed{\alpha = \frac{5}{2} \frac{\mu_d g}{R}}$$

$$v_{cm}(t) = v_0 + a_{cm} t = v_0 - \mu_d g t$$

$$\omega(t) = \omega_0 + \alpha t = \frac{5}{2} \frac{\mu_d g}{R} t$$

$$v_{cm}(t_1) = \omega(t_1) R$$

$$\Rightarrow \quad v_0 - \mu_d g t_1 = \frac{5}{2} \frac{\mu_d g}{\cancel{R}} t_1 \cdot \cancel{R}$$

$$v_0 = \frac{7}{2} \mu_d g t_1 \quad \Rightarrow \quad t_1 = \frac{2 v_0}{7 \mu_d g} = 2.04 \text{ s}$$

$$W_{ett,\, 0 \to t_1} = ?$$

$$W_{TOT} = W_{ett} = \Delta E_K = E_{K,f} - E_{K,i}$$

$$W_{ett,\, 0 \to t_1} = \left(\frac{1}{2} I_0 \omega_1^2 + \frac{1}{2} m v_{cm,1}^2 \right) - \frac{1}{2} m v_0^2$$

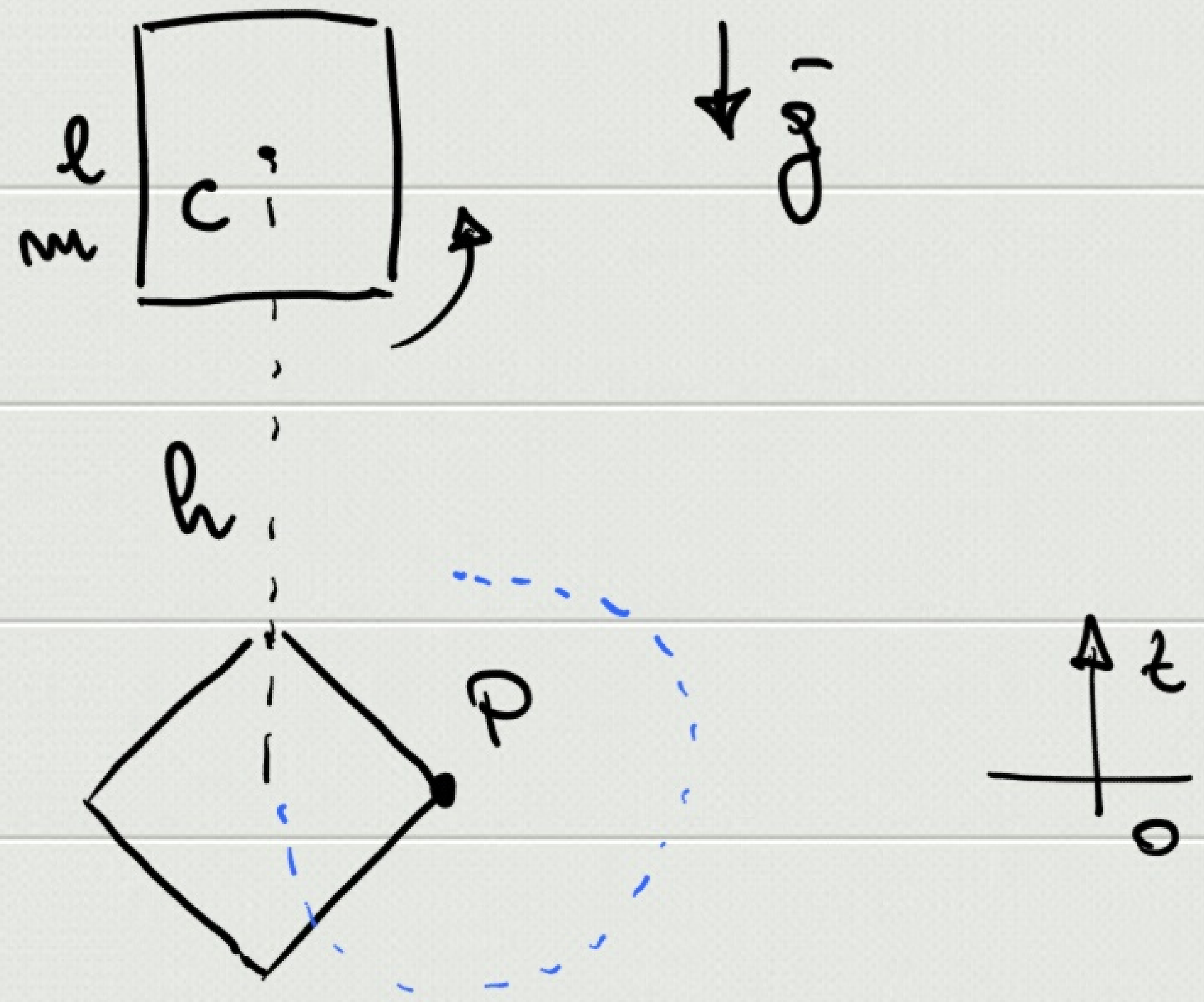
$$v_{cm,1} = v_0 - \mu_d g t_1 = v_0 - \cancel{\mu_d g} \frac{2 v_0}{7 \cancel{\mu_d g}} = \frac{5}{7} v_0$$

$$\omega_1 = v_{cm,1}/R = \frac{5 v_0}{7 R}$$

$$\Rightarrow W_{ett,\,0\to t_1} = -\frac{1}{7} m v_0^2 = -1.4 \text{ J}$$

$$W_{\substack{ett\\trasl}} = \int \bar{f}_{ad}\, d\bar{s} = -\frac{12}{49} m v_0^2$$

$$W_{ett,\,rot} = \int M_{ett}\, d\theta = \int R f_{as}\, d\theta = \frac{5}{49} m v_0^2$$



$l = 0.18\ m$

$m = 0.8\ kg$

$\omega_0 = 10\ rad/s$

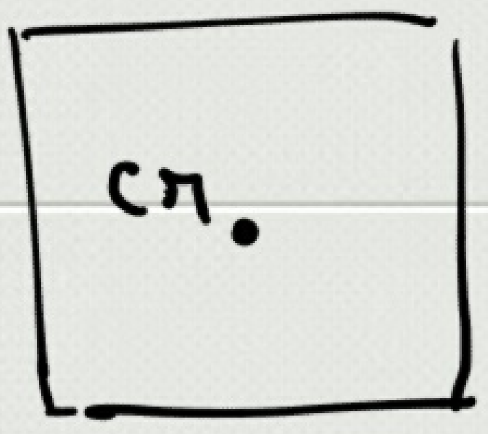
$h = 0.75\ m$

$t_0 \qquad \omega(t_0^+)$

$$4mgh = \frac{1}{2} 4m v_{cm}^2 \quad \Longrightarrow \quad \boxed{v_{cm} = \sqrt{2gh}}$$

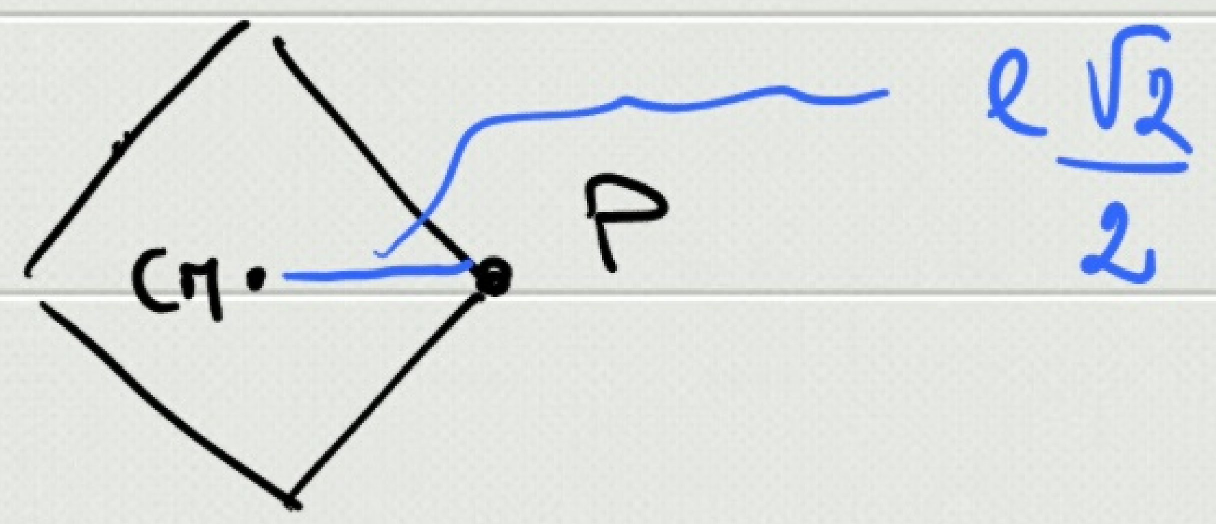
$$\left(+ \cancel{\frac{1}{2} I_{cm} \omega_0^2}\right) \qquad \left(+ \cancel{\frac{1}{2} I_{cm} \omega_0^2}\right)$$

$$\bar{L}_P = cost$$



$$I_{cm} = 4 I_{sb,cm} = 4\left(\frac{1}{12} m l^2 + m \frac{l^2}{4}\right) =$$

$$= \frac{4}{3} m l^2$$



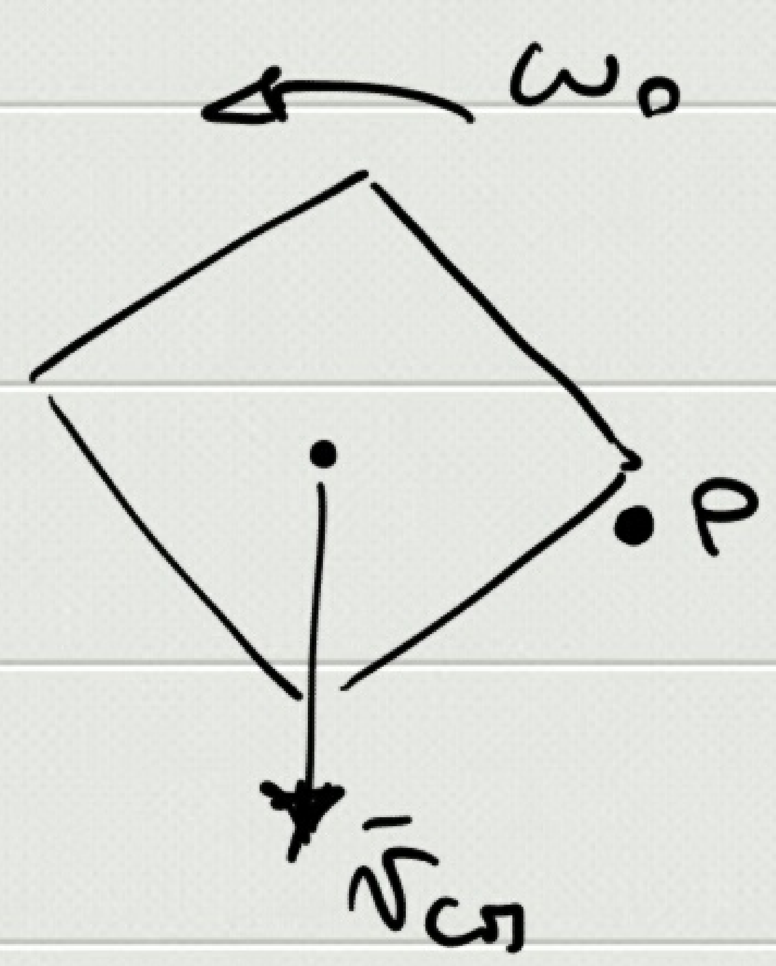
$$I_p = 4\left(\frac{1}{12} m l^2 + \frac{m l^2}{4}\right) + 4m\frac{l^2}{2} \qquad *$$

$$I_p = 4 \cdot \frac{1}{3} m l^2$$

$$I_p = 2\left[\frac{1}{3} m l^2 + \left(\frac{1}{3} m l^2 + m l^2\right)\right]$$

$$I_p = 2\left[\frac{1}{3} m l^2 + \left(\frac{1}{12} m l^2 + \frac{5}{4} m l^2\right)\right] \qquad *$$

$$\boxed{I_p = \frac{10}{3} m l^2}$$



$$\boxed{\bar{L}_p(t_0^-) = \bar{L}_p(t_0^+)}$$

$$\hookrightarrow \bar{L}'_{cm} + \bar{r} \times m \bar{v}_{cm}$$

$$I_0 \omega_0 - \frac{l\sqrt{2}}{2} 4m v_{cm} = I_p \omega$$

$$I_0 \omega_0 + \frac{l\sqrt{2}}{2} 4m v_{cm} = I_p \omega \qquad *$$

$$I_p \omega_0 - \cancel{\frac{l\sqrt{2}}{2} 4m} v_{cm} = I_p \omega$$

$$I_p \omega_0 + \cancel{\frac{l\sqrt{2}}{2} 4m} v_{cm} = I_p \omega$$

$$\omega = \frac{2}{5}\omega_0 + \frac{6\sqrt{gh}}{5l} = 22.1 \text{ rad/s}$$

$$\bar{J}_{piolo} = ?$$

$$\bar{J} = \Delta\bar{P} = \bar{P}^+ - \bar{P}^- \qquad \bar{P} = m_{TOT}\,\bar{v}_{CM}$$

$$\bar{P}^- = 4m\,\bar{v}_{CM}(-\bar{u}_z) \quad \bar{P}^+ = 4m\,\omega\,\frac{l\sqrt{2}}{2}(-\bar{u}_z)$$

$$\bar{J} = 3.28\,\bar{u}_z \text{ Ns}$$