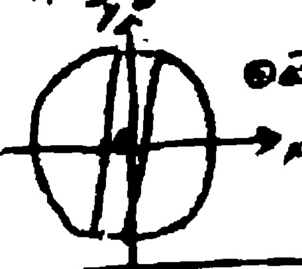
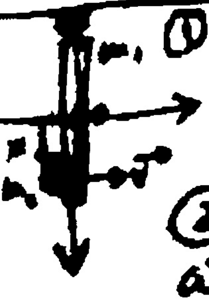
$m_1 = ?\,kg \quad m_2 = 1.5\,kg \quad \omega_0 = [illegible]\,\frac{rad}{s}$

Conservazione momento angolare



$L_0 = I\omega_0 = \frac{m_1 r^2}{2}\omega_0 = L_1 = \frac{m_1 r^2}{2}\omega + m_2 r^2\omega$

$\frac{m_1 r^2 \omega_0}{2} = r^2\omega\left(\frac{m_1}{2} + m_2\right) \quad \omega = \frac{m_1\omega_0}{m_1 + 2m_2} = [illegible]\,\frac{rad}{s} = 4.5\,\frac{rad}{s}$



① $m_2 v = (m_1 + m_2)v_{cm} \quad v_{cm} = \frac{m_2}{m_1+m_2}v \quad r_{cm} = \frac{x m_2}{m_1 + m_2}$

$(x - l/2)m_2 v = I\omega = \left(\frac{m_1\ell^2}{12} + r_{cm}^2 m_1 + m_2(x - r_{cm})^2\right)\omega \quad \omega = \frac{[illegible]\,v}{I}$

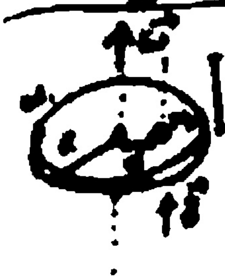
② $m_1 = m_2 = m \quad x = r \quad r\mu v = I\omega = \left(\frac{m\ell^2}{12} + \mu r^2\right)\omega$

$\omega = \frac{rv}{\frac{\ell^2}{6} + r^2} \qquad J = \Delta p = m\omega r - mv$

$J_x = \Delta p_x = -m_2 v$

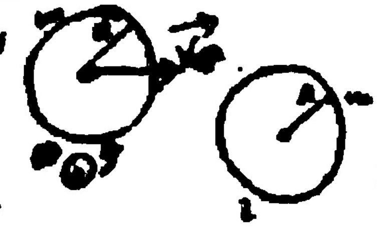
$I\omega = I'\omega' \quad \frac{m_1\ell^2}{12}\omega = \left(\frac{m_1\ell^2}{12} + \frac{m_2\ell^2}{4}\right)\omega' \quad \omega' = \frac{m_1\omega}{m_1 + 3m_2}$

$J_y = \Delta p_y = m_2\omega'\frac{\ell}{2} \qquad J = \sqrt{J_x^2 + J_y^2} \quad \theta = \arctan\frac{J_y}{J_x}$



$I\omega = I'\omega' \quad \frac{1}{2}m_1 R^2\omega = \left(\frac{1}{2}m_1 R^2 + m_2 d^2\right)\omega' \quad \omega' = \frac{m_1 R^2\omega}{m_1 R^2 + 2m_2 d^2}$

$J = m_2\sqrt{2gh} \qquad$ Impulso angolare $= Jd$



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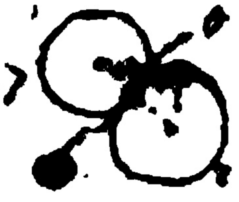
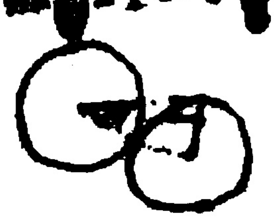


1: m, R, v≠0, ω = 0
2: m, R, v = 0, ω = 0
1,2: cm [illegible], v_{cm}, ω

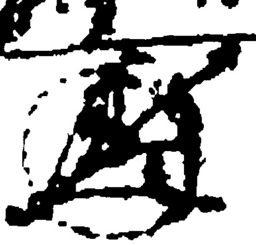
$mv = 2m\,v_{cm} \quad v_{cm} = \frac{v}{2} \qquad P_{cm}: 0 \quad L_i = mRv\sin\theta - I\omega = [illegible]Rmv - \frac{1}{2}mR^2\omega$

$L_f = 0 \quad \Rightarrow [illegible]Rmv = \frac{mR^2}{2}\omega \qquad \omega = \frac{2v\sin\theta}{R} \qquad \omega = \frac{v}{R}$



$2R\sin\theta = R$
$\sin\theta = \frac{1}{2}$
$\theta = \frac{\pi}{6}$

$[illegible] = \frac{GM}{R} \quad T = \frac{2\pi R}{v} \quad T^2 = \frac{4\pi^2 R^2}{v^2} = \frac{4\pi^2}{GM}R^3$



$P = m\,v_{cm} = 0 \qquad L = 3Rmv$

$\frac{mv^2}{R} = [illegible] + [illegible] = [illegible] + [illegible] \qquad v = \sqrt{\frac{G}{R}(m + [illegible]m)}$

$T = \frac{2\pi R}{v}$

$E_k \quad \frac{1}{\mu} = \frac{1}{M} + \frac{1}{m} = \frac{M+m}{Mm} \quad \mu = \frac{Mm}{m+M} \qquad E_k = [illegible] + [illegible]$