DRUHÁ PÍSOMKA Z FYZIKY 1 – RIEŠENIA

LS 2022/2023

1. $L_1\ x$

$$\omega = \sqrt{\frac{mgr}{J}} \Rightarrow T = 2\pi\sqrt{\frac{J}{mgr}}$$

$$r = x \qquad J = J_T + mx^2 = \frac{1}{12}mL^2 + mx^2$$

$$T = 2\pi\sqrt{\frac{\frac{1}{12}mL^2 + mx^2}{mgx}} = \underline{\underline{2\pi\sqrt{\frac{L^2 + 12x^2}{12gx}}}}$$

2. $R_1\ r_1\ J$

$$E_k = \frac{1}{2}mv^2 + \frac{1}{2}J\omega^2$$

$$J = \frac{2}{5}mR^2 \Rightarrow m = \frac{5J}{2R^2}$$

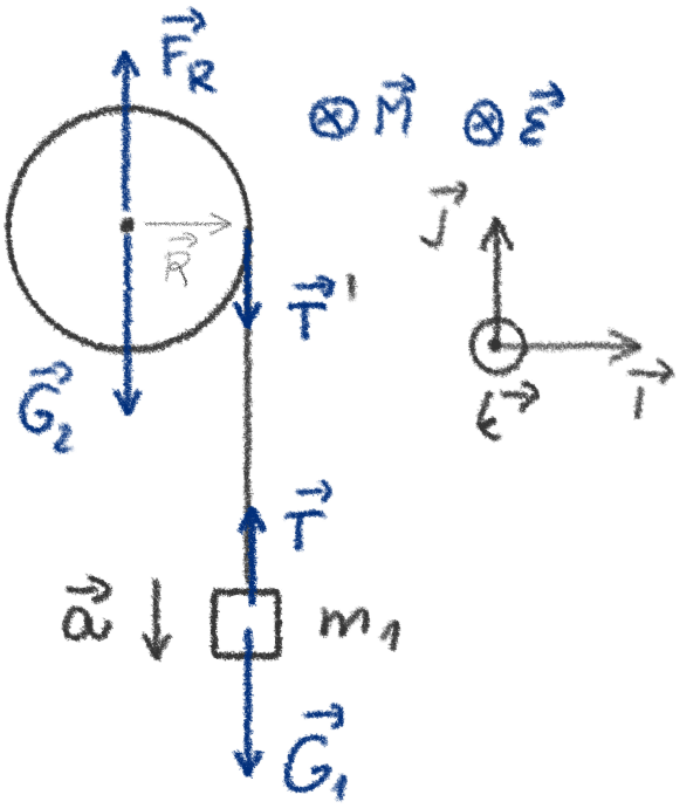
$$\omega = \frac{v}{R}$$

$$E_k = \frac{1}{2}\frac{5}{2}\frac{J}{R^2}v^2 + \frac{1}{2}J\frac{v^2}{R^2} = \frac{1}{2}\frac{J}{R^2}v^2\left(\frac{5}{2}+1\right) = \underline{\underline{\frac{7}{4}\frac{J}{R^2}v^2}}$$

Alebo: $E_k = \frac{1}{2}mv^2 + \frac{1}{2}\frac{2}{5}mR^2\frac{v^2}{R^2} = \frac{7}{10}mv^2$

3. $m_1\ a$

m_2



teleso:

$$m_1\vec{a} = \vec{G}_1 + \vec{T}$$

valec:

$$0 = \vec{G}_2 + \vec{F}_R$$

$$\vec{M} = \vec{R} \times \vec{T}'$$

$$-m_1 a = -m_1 g + T$$

$$-J\varepsilon = -R \cdot T'$$

$$\varepsilon = \frac{a}{R} \quad ; \quad J = \frac{1}{2} m_2 R^2 \quad ; \quad T = T'$$

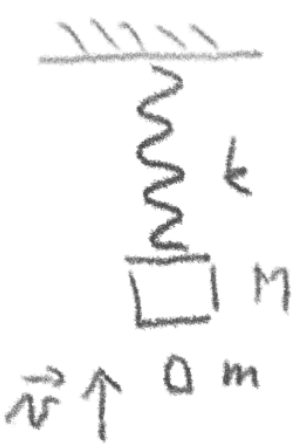
$$m_1 a = m_1 g - T \qquad m_1(g-a) = T$$

$$\frac{1}{2} m_2 R^2 \frac{a}{R} = R \cdot T \qquad \frac{1}{2} m_2 a = T$$

$$m_2 = \frac{2T}{a} = \frac{2}{a} m_1 (g-a)$$

$$\underline{\underline{m_2 = 2 m_1 \left(\frac{g}{a} - 1\right)}}$$

4. $\dfrac{k, M, v, m}{A, \ \dfrac{E_m}{E_{k0}}}$



Nepružná zrážka

$$m v = (m+M) v_m$$

$v_m = \frac{m}{m+M} v$ → amplitúda rýchlosti oscilátora

$$v_m = A\omega \Rightarrow A = \frac{v_m}{\omega} \qquad \omega = \sqrt{\frac{k}{m+M}}$$

$$A = v_m \sqrt{\frac{m+M}{k}} = v \frac{m}{m+M} \sqrt{\frac{m+M}{k}} = \underline{\underline{\frac{v m}{\sqrt{k(m+M)}}}}$$

$$E_{k0} = \frac{1}{2} m v^2 \qquad E_m = \frac{1}{2}(m+M) v_m^2 =$$

$$= \frac{1}{2} \frac{v^2 m^2}{m+M}$$

$$\frac{E_m}{E_{k0}} = \frac{\frac{1}{2} m^2 v^2}{\frac{1}{2}(m+M) m v^2} = \underline{\underline{\frac{m}{m+M}}}$$