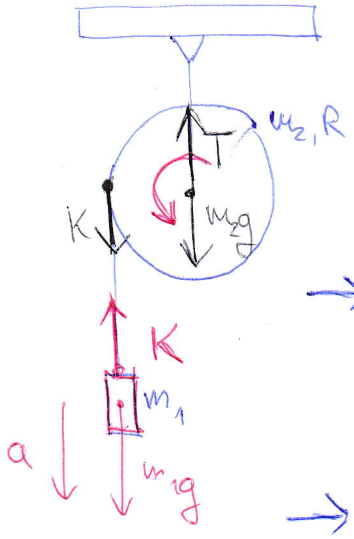
F1



$$\boxed{\Theta = \frac{1}{2} m_2 R^2}$$

→ 1-es test mozgásegyenlete

$$\boxed{m_1 \cdot a = m_1 \cdot g - K}$$ ⤳ $K = m_1 \cdot (g - a)$

→ Forgás alapegyenlete a csigára

$$\boxed{\Theta \cdot \beta = K \cdot R}$$

→ Kötél nem csúszik meg:

$$\boxed{a = R \cdot \beta}$$

$$\Theta \cdot \frac{a}{R} = m_1 \cdot (g - a) \cdot R$$

$$\frac{1}{2} m_2 R^2 \cdot \frac{a}{R} = (m_1 \cdot g - m_1 \cdot a) \cdot R$$

$$\frac{1}{2} m_2 \cdot a = m_1 g - m_1 a$$

$$\boxed{a = \frac{2 m_1}{2 m_1 + m_2} g}$$

$$\boxed{\beta = \frac{2 m_1}{2 m_1 + m_2} \cdot \frac{g}{R}}$$

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

TK tétel:

$$a_{TK} = \frac{m_1 a + \emptyset}{m_1 + m_2}$$

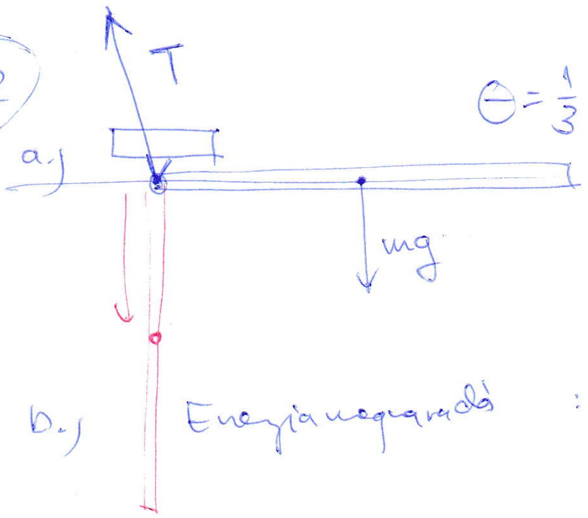
$$\underbrace{(m_1+m_2)\cdot a_{TK}}_{m_1 \cdot a} = (m_1+m_2)\cdot g - T$$

$$\Downarrow$$

$$T = (m_1+m_2)g - m_1 \cdot a$$ stimmel

F2

a.)



$\Theta = \frac{1}{3} m L^2$ a végpontra

b.) Energiamegmaradás: előtte: $E_h = 0$

$E_f = 0$

utána

$$E_h = -mg\frac{L}{2}$$

$$E_f = \frac{1}{2}\Theta \cdot \omega^2 = \frac{1}{6} m L^2 \omega^2$$

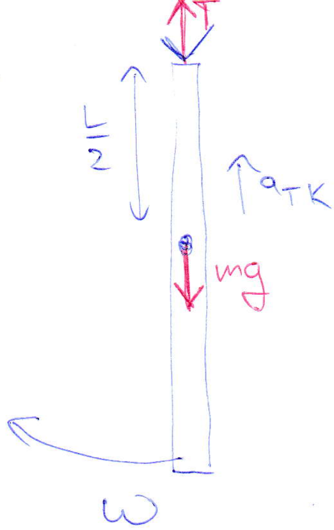
$$E_h + E_f = 0$$

$$\Downarrow$$

$$\frac{1}{6} m L^2 \omega^2 - mg\frac{L}{2} = \emptyset$$

$$\boxed{\omega = \sqrt{\frac{3g}{L}}}$$

c)



TK gyorsulása (centripetális gyorsulás)

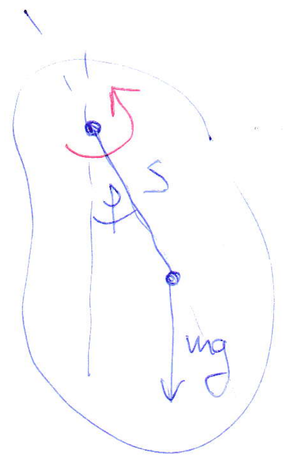
$$a_{TK} = \frac{L}{2}\cdot\omega^2 = \frac{L}{2}\,\frac{3g}{L} = \frac{3}{2}g$$

TK-tétel:

$$m\cdot a_{TK} = T - m\cdot g$$

$$\boxed{T = \frac{3}{2}mg + mg = \frac{5}{2}mg}$$

F3



Erőkar: $k = s\cdot\sin\varphi$

$$\Theta\cdot\beta = -m\cdot g\cdot s\cdot\sin\varphi$$

$$\beta = -\frac{mgs}{\Theta}\cdot\sin\varphi$$

ha φ pozitív, akkor visszafelé szöggyorsul

Analógia:

$$m\cdot a = -D\cdot x$$

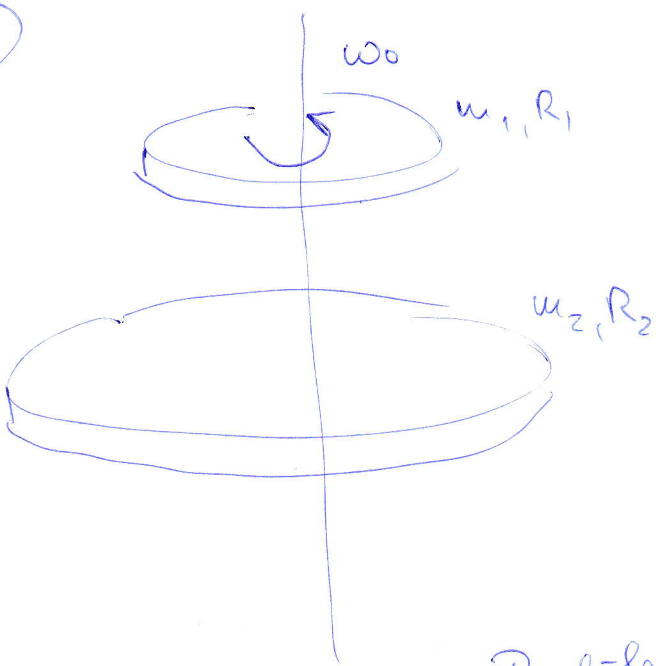
$$a = -\frac{D}{m}\cdot x \qquad \frac{D}{m} = \left(\frac{2\pi}{T}\right)^2$$

$$T = 2\pi\sqrt{\frac{m}{D}}$$

ugyanígy

$$\boxed{T_{inga} = 2\pi\cdot\sqrt{\frac{\Theta}{mgs}}}$$

F4



$$\Theta_1 = \frac{1}{2} m_1 R_1^2$$

$$\Theta_2 = \frac{1}{2} m_2 R_2^2$$

$$\Theta_{után} = \Theta_1 + \Theta_2$$

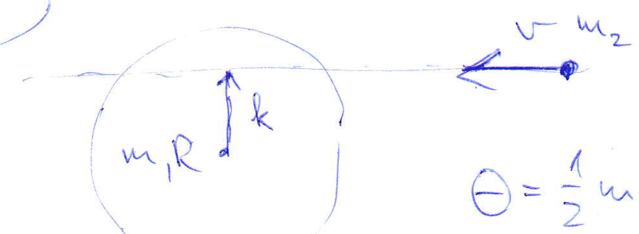
Perdület megmaradás:

$$\left.\begin{aligned} N_1^{előtt} &= \Theta_1 \cdot \omega_0 \\ N_2^{előtt} &= \emptyset \end{aligned}\right\} N^{előtt} = \Theta_1 \omega_0$$

$$N^{után} = (\Theta_1 + \Theta_2) \cdot \omega$$

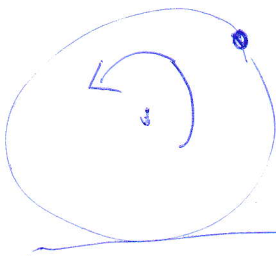
$$\rightarrow \boxed{\omega = \frac{\Theta_1}{\Theta_1 + \Theta_2} \omega_0 = \frac{m_1 R_1^2}{m_1 R_1^2 + m_2 R_2^2} \cdot \omega_0}$$

F5



$$\Theta = \frac{1}{2} m R^2$$

utána



$$\boxed{\tilde{\Theta} = \Theta + m_2 R^2}$$

$$N^{előtt} = ?$$

tömegpont tengelyre vonatkoztatott perdülete:

$$\boxed{N = m_2 \cdot v \cdot k}$$ (m_2 · „területi sebesség")

$$\boxed{N^{után} = \tilde{\Theta} \cdot \omega}$$

$N^{előtt} = m_2 \cdot v \cdot \frac{2}{3} R$

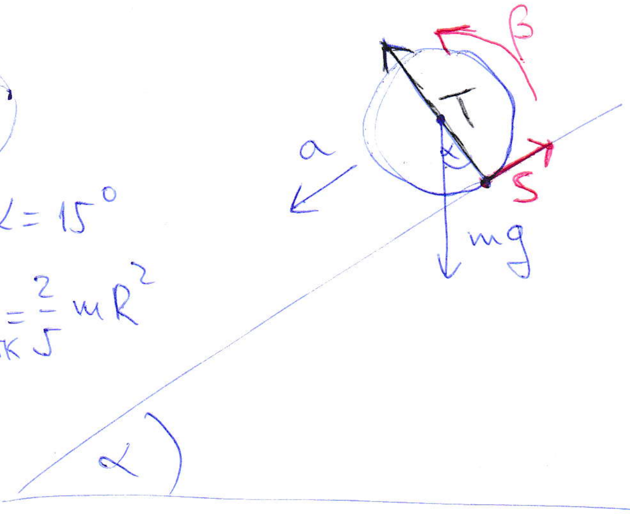
$$\hookrightarrow \quad m_2 v \cdot \frac{2}{3} R = \left(\frac{1}{2} m R^2 + m_2 R^2 \right) \cdot \omega$$

$$\boxed{\omega = \frac{\frac{2}{3} m_2 v R}{\frac{1}{2} m R^2 + m_2 R^2} = \frac{\frac{4}{3} m_2}{m + 2 m_2} \cdot \frac{v}{R}}$$

F6.

$\alpha = 15^\circ$

$\Theta_{TK} = \frac{2}{5} m R^2$



→ Mozg

$$\boxed{m \cdot a = m g \cdot \sin\alpha - S} \quad (1)$$

→ Forg

$$\Theta_{TK} \cdot \beta = S \cdot R$$

$$\boxed{\frac{2}{5} m R^2 \beta = S \cdot R} \quad (2)$$

→ Gördülés

$$\boxed{a = R \cdot \beta} \quad (3)$$

(2) és (3)

$$\frac{2}{5} m \cdot R \cdot a = S \cdot R$$

$$\hookrightarrow \quad \boxed{S = \frac{2}{5} m \cdot a}$$

(1)-be

$$m \cdot a = m g \sin\alpha - \frac{2}{5} m \cdot a$$

$$\boxed{a = \frac{g \cdot \sin\alpha}{\frac{7}{5}} = \frac{5}{7} g \cdot \sin\alpha}$$

tapados?

$$S = \frac{2}{5} m \cdot a = \frac{2}{5} m \cdot \frac{5}{7} g \cdot \sin\alpha = \frac{2}{7} mg \sin\alpha$$

$$T = mg \cdot \cos\alpha$$

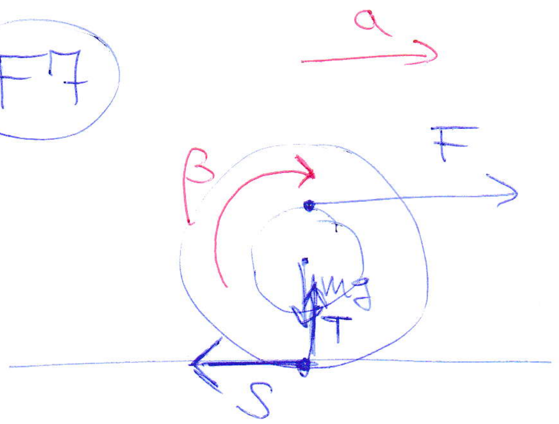
$$S \leq \mu_t T$$

$$\frac{2}{7} mg \sin\alpha \leq \mu_t mg \cos\alpha$$

$$\boxed{\frac{2}{7} \operatorname{tg}\alpha \leq \mu_t}$$

$\alpha = 15^0 \Rightarrow \boxed{0.077 \leq \mu_t}$

F7



$$m \cdot a = F - S$$

$$\Theta \cdot \beta = F \cdot r + S \cdot R$$

$$a = R \cdot \beta$$

$$\Rightarrow \Theta \cdot \frac{a}{R} = F \cdot r + S \cdot R \qquad (1)$$

$$m \cdot a = F - S \qquad (2)$$

$$\frac{1}{R}(1) + (2)$$

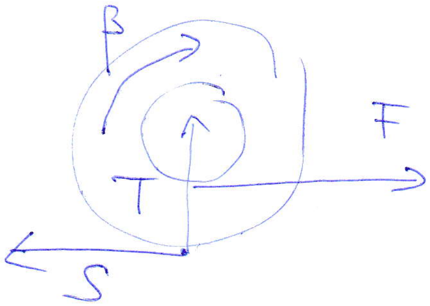
$$\frac{\Theta}{R^2} \cdot a + m \cdot a = F \cdot \left(1 + \frac{r}{R}\right)$$

$$\boxed{a = \frac{F\left(1 + \frac{r}{R}\right)}{\frac{\Theta}{R^2} + m}}$$

$$S = F - ma = F - \frac{m F \left(1 + \frac{r}{R}\right)}{\frac{\Theta}{R^2} + m}$$

$$\mu_t \geq \frac{S}{T} = \frac{F - F \cdot \dfrac{(1+r/R)}{\dfrac{\Theta}{mR^2}+1}}{m \cdot g}$$

Másik eset:



$$m \cdot a = F - S \qquad (1)$$

$$\Theta \cdot \frac{a}{R} = S \cdot R - F \cdot r \qquad (2)$$

$$\frac{1}{R} \cdot (2) + (1)$$

$$\Downarrow$$

$$\Theta \cdot \frac{a}{R^2} + m \cdot a = F\left(1 - \frac{r}{R}\right)$$

$$\boxed{a = \frac{F \cdot (1 - r/R)}{\dfrac{\Theta}{R^2} + m}}$$

$$S = F - m \cdot a =$$

$$= F - F \cdot \frac{(1 - r/R)}{\dfrac{\Theta}{mR^2} + 1}$$