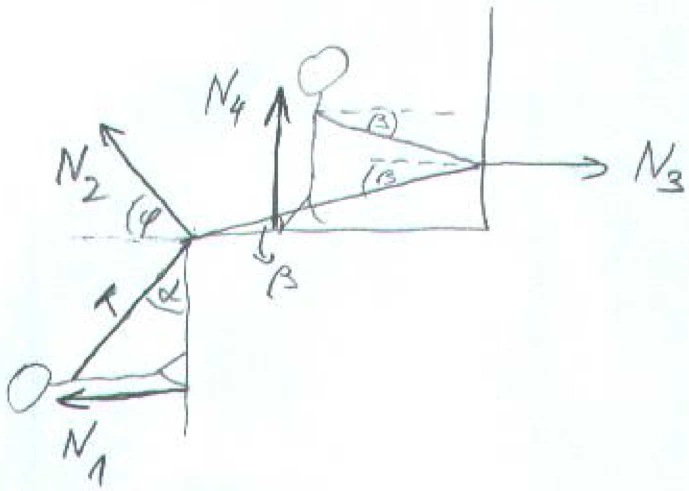
1C



T → NAPETOST NITI

$$T\cos\alpha = m_2 g \Rightarrow \boxed{T = \frac{m_2 g}{\cos\alpha}}$$

3 BODA

$$N_1 = T\sin\alpha \Rightarrow \boxed{N_1 = m_2 g \operatorname{tg}\alpha}$$

3 BODA

$$\left.\begin{aligned} N_2\cos\varphi + T\sin\alpha &= T\cos\beta \\ N_2\sin\varphi + T\sin\beta &= T\cos\alpha \end{aligned}\right\}$$

$$\left.\begin{aligned} N_2\cos\varphi &= T(\cos\beta - \sin\alpha) \\ N_2\sin\varphi &= T(\cos\alpha - \sin\beta) \end{aligned}\right\}$$ KVADRIRANJE PA ZBRAJANJE

$$N_2^2 = T^2\left(\cos^2\beta - 2\cos\beta\sin\alpha + \sin^2\alpha + \cos^2\alpha - 2\cos\alpha\sin\beta + \sin^2\beta\right)$$

$$= T^2\left[2 - 2\left(\cos\beta\sin\alpha + \cos\alpha\sin\beta\right)\right]$$

$$= 2T^2\left[1 - \sin(\alpha+\beta)\right]$$

$$\boxed{N_2 = T\sqrt{2[1-\sin(\alpha+\beta)]} = \frac{m_2 g}{\cos\alpha}\sqrt{2[1-\sin(\alpha+\beta)]}}$$

3 BODA

$$\boxed{N_3 = 2T\cos\beta = 2m_2 g\frac{\cos\beta}{\cos\alpha}}$$

3 BODA

$$N_4 = m_1 g + T\sin\beta$$

$$\boxed{N_4 = m_1 g + m_2 g\frac{\sin\beta}{\cos\alpha}}$$

3 BODA

3.

$$\boxed{\begin{aligned} V_r &= \frac{dr}{dt} \\ V_\varphi &= r\frac{d\varphi}{dt} \end{aligned}}$$

5 BODOVA

ULANČANO DERIVIRANJE:

$$V_r = \frac{dr}{dt} = \underbrace{\frac{dr}{d\varphi}} \cdot \underbrace{\frac{d\varphi}{dt}}$$

$$\frac{dr}{d\varphi} = 3 r_0 \varphi^2$$

$$V_\varphi = r\frac{d\varphi}{dt} \Rightarrow \int_0^\varphi r(\varphi)\,d\varphi = \int_0^t V_\varphi(t)\,dt$$

$$r_0 \int_0^{\varphi(t)} \varphi'^3\,d\varphi' = a_0 \int_0^t t'\,dt \Rightarrow r_0 \frac{\varphi^4(t)}{4} = a_0 \frac{t^2}{2}$$

$$\Rightarrow \boxed{\varphi(t) = \sqrt[4]{2\frac{a_0}{r_0}}\ \sqrt{t}}$$

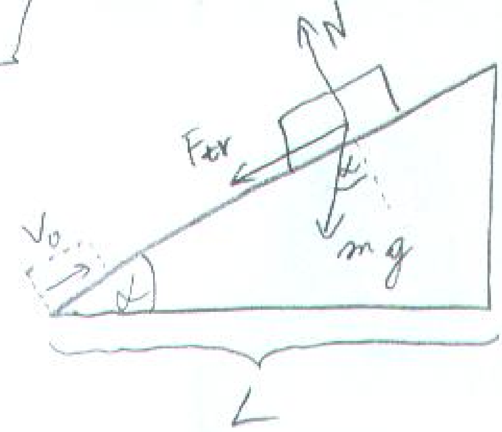
5 BODOVA

$$V_r(t) = \left[\frac{dr}{d\varphi}(t)\right] \cdot \left[\frac{d\varphi}{dt}(t)\right] = 3r_0\sqrt{2\frac{a_0}{r_0}}\,t \cdot \sqrt[4]{2\frac{a_0}{r_0}} \cdot \frac{1}{2\sqrt{t}}$$

$$\boxed{V_r(t) = \frac{3r_0}{2}\left(\frac{2a_0}{r_0}\right)^{3/4}\sqrt{t}}$$

5 BODOVA

4.



$N = mg\cos\alpha$

$ma = mg\sin\alpha + \mu N$

$$\Rightarrow \boxed{a_{UZ} = g(\sin\alpha + \mu\cos\alpha)}$$

UBRZANJE DOK SE TIJELO DIŽE UZ KOSINU

TEMELJNA JEDNADŽBA ZA KORIŠTENJE JE VEZA BRZINE, UBRZANJA I PRIJEĐENOG PUTA:

$$\boxed{V^2(s) = V_0^2 \pm 2aS}$$

TIJELO ĆE SE ZAUSTAVITI NA VRHU KOSINE AKO VRIJEDI:

$$V\left(\frac{L}{\cos\alpha}\right) = 0 \quad \Rightarrow \quad V_0 = \sqrt{2a_{UZ}\cdot\frac{L}{\cos\alpha}}$$

UVJETI:

a) DA BI TIJELO IZLETJELO S KOSINE:

$$V_0 > \sqrt{2gL(\mu + tg\,\alpha)}$$

2 BODA

AKO TIJELO STANE USRED KOSINE, GRAVITACIJA GA POKUŠAVA VRATITI DOLJE, DOK SE TRENJE OPIRE:

$$mg\sin\alpha \gtrless \mu mg\cos\alpha$$

b) DA BI TIJELO OSTALO NA KOSINI:

$$V_0 < \sqrt{2gL(\mu + tg\,\alpha)}$$

&

$$\mu \geq tg\,\alpha$$

2 BODA

c) DA BI TIJELO KLIZNULO NIZ KOSINU:

$$V_0 < \sqrt{2gL(\mu + tg\,\alpha)}$$

&

$$\mu < tg\,\alpha$$

2 BODA

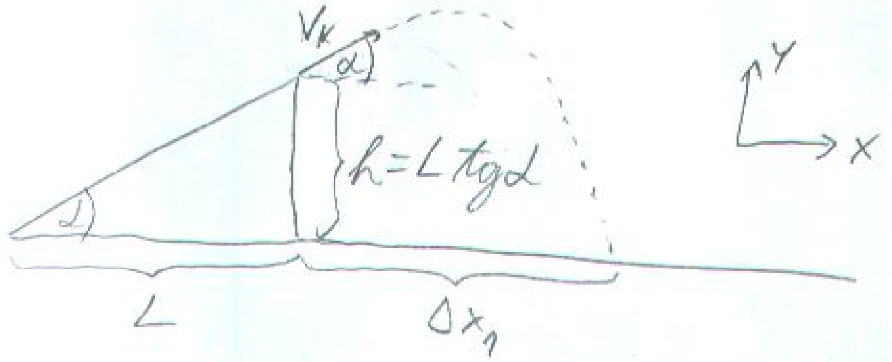
RAČUN PO SLUČAJEVIMA:

a) TIJELO IZLJEĆE S KOSINE:

$$\boxed{v_k = \sqrt{v_0^2 - 2gL(\mu + tg\alpha)}}$$

2 BODA

→ KONAČNA BRZINA PO ODVAJANJU OD KOSINE



KOSI HITAC: $y(t) = v_k t_p \sin\alpha - \dfrac{g t_p^2}{2} = -h$

↓ UVJET NA TRENUTAK PADA

$$\Rightarrow t_p^2 \cdot \frac{g}{2} - t_p \cdot v_k \sin\alpha - L\,tg\alpha = 0$$

$$\Rightarrow t_{1/2} = \frac{v_k \sin\alpha \pm \sqrt{v_k^2 \sin^2\alpha + 4 \cdot \frac{g}{2} \cdot L\,tg\alpha}}{g}$$

→ JEDNO OD RJEŠENJA JE NEGATIVNO ($t_2 < 0$)

$$\Rightarrow \boxed{t_p = \frac{v_k \sin\alpha + \sqrt{v_k^2 \sin^2\alpha + 2gL\,tg\alpha}}{g}}$$

PRIJEĐENI PUT U x-SMJERU PRIJE PADA:

$$\boxed{\Delta x_1 = V_K \cos\alpha \cdot t_P}$$

2 BODA

PRIJE ZAUSTAVLJANJA ZBOG TRENJA, TIJELO JOŠ PRELAZI PUT PO PODLOZI:

$$V_K \cos\alpha = \sqrt{2 a_{TRENJE} \Delta x_2} \Rightarrow \boxed{\Delta x_2 = \frac{V_K^2 \cos^2\alpha}{2 g \mu}}$$

2 BODA

KOORDINATA ZAUSTAVLJANJA:

$$\boxed{X_0 = L + \Delta x_1 + \Delta x_2}$$

b) TIJELO OSTAJE NA KOSINI:

$$V_0^2 = 2 a_{UZ} \cdot \frac{x_0}{\cos\alpha} \Rightarrow x_0 = \frac{V_0^2 \cos\alpha}{2 a_{UZ}}$$

$$\boxed{x_0 = \frac{V_0^2 \cos\alpha}{2g(\sin\alpha + \mu\cos\alpha)}}$$

2 BODA

c) TIJELO KLIZNE S KOSINE:

KAO U SLUČAJU b), TIJELO ĆE SE PRVO ZAUSTAVITI NAKON PUTA Δl PO KOSINI:

$$\boxed{\Delta l = \frac{V_0^{\,2}}{2g(\sin\alpha + \mu\cos\alpha)}}$$

2 BODA

TADA ĆE BITI UBRZANO NIZ KOSINU:

$$a_{NIZ} = g(\sin\alpha - \mu\cos\alpha)$$

PRI DNU KOSINE DOBIT ĆE BRZINU:

$$\boxed{V_{DNO} = \sqrt{2a_{NIZ}\Delta l} = V_0\sqrt{\frac{1-\mu\,tg\alpha}{1+\mu\,tg\alpha}}}$$

2 BODA

JOŠ SAMO TREBA USPORITI S TE BRZINE (NJENE PROJEKCIJE NA x-OS) NA PODLOZI:

$$(V_{DNO}\cos\alpha)^2 = 2a_{TRENJE}|x_0| \Rightarrow x_0 = -\frac{V_{DNO}^{\,2}\cos^2\alpha}{2g\mu}$$

$$\boxed{x_0 = -\frac{V_0^{\,2}\cos^2\alpha}{2g\mu}\,\frac{1-\mu\,tg\alpha}{1+\mu\,tg\alpha}}$$

2 BODA