1) Rad je u ovom slučaju razlika kin. energija između točke 1 i 2.

$$W = E_{k1} - E_{k2} = \frac{m}{2}\left(v_1^2 - v_2^2\right) = \frac{m}{2} v_2^2\left(\left(\frac{v_1}{v_2}\right)^2 - 1\right)$$

$$L = |\vec{r} \times \vec{p}| = |\vec{r} \times m\vec{v}|$$

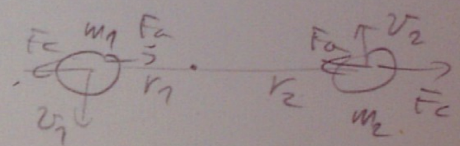
$$L_1 = L_2 \quad \Rightarrow \quad m v_1 r_1 = m v_2 r_2$$

$$v_1 = \frac{r_2}{r_1} v_2$$

---

2) Pošto se tako gibaju znači da su cijelo vrijeme jedna nasuprot druge $\Rightarrow T_1 = T_2$

$$T = \frac{2\pi}{\omega} = \frac{2\pi v}{r}$$



$$\frac{2\pi v_1}{r_1} = \frac{2\pi v_2}{r_2} \Rightarrow r_2 = \frac{v_2}{v_1} \cdot r_1$$

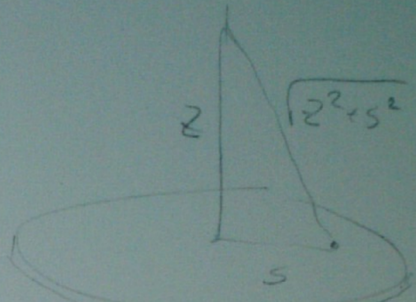
$$F_{c1} = F_G = F_{c2}$$

$$\frac{m_1 v_1^2}{r_1} = \frac{m_2 v_2^2}{r_2} = G_N \frac{m_1 m_2}{(r_1+r_2)^2}$$

$\vdots$

$$m_1 = \frac{r_1 r_2}{G_N r_1}\left(r_1 + r_2\right)^2$$

3) g - grav. polje Φ - grav. pot.



polje $\vec{g}[\vec{r}] = -\frac{d}{d\vec{r}} \Phi[\vec{r}]$

pot. $\Phi[\vec{r}] = -G_N \int \frac{dm}{r}$ $\sqrt{z^2+s^2}$

$$dm = \sigma\, dS = \frac{M}{R^2\pi} 2\pi s\, ds = \frac{2M}{R^2} s\, ds$$

σ → $\frac{M}{R^2\pi}$ - površinska gustoća

dS → $2\pi s\, ds$

$$\Phi[z] = -G_N \frac{2M}{R^2} \int_0^R \frac{s\, ds}{\sqrt{z^2+s^2}} = -G_N \frac{2M}{R^2}\left(\sqrt{R^2+z^2} - z\right)$$

$$g[z] = \left| \frac{d}{dz} \Phi[z] \right| = G_N \frac{2M}{R^2}\left(1 - \frac{1}{\sqrt{1+\left(\frac{R}{z}\right)^2}}\right)$$

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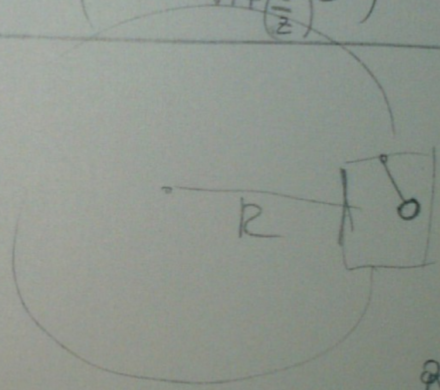
4) $v = 100 \frac{km}{h} = \frac{1000}{36} \frac{m}{s}$



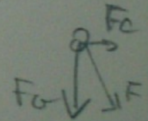
$m = 1\ kg$

$F = 12\ N$

$R = ?$

$$F_c = \sqrt{F^2 - F_G^2}$$

$$\frac{mv^2}{R} = \sqrt{F^2 - F_G^2}$$



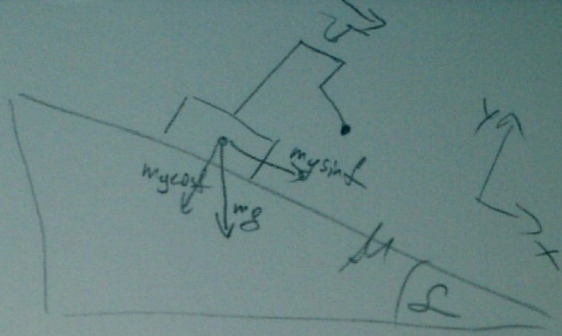
$$R = \frac{mv^2}{\sqrt{F^2 - F_G^2}} = \frac{mv^2}{\sqrt{F^2 - (mg)^2}}$$

On je ovdje nešto izvadio preko inercijalnih sustava; tj. bezveze komplicirao.

$$m\, \vec{a'} = \vec{F} - m \cdot \vec{A}$$

unutar S — stvarna sila — akceleracija sustava S'

5.



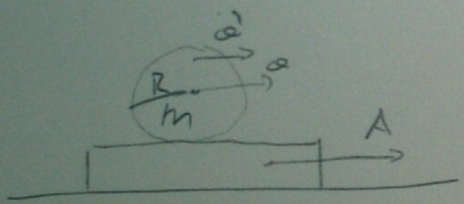
$$\vec{A} = g(\sin\alpha - \mu\cos\alpha)\,\vec{i}$$

$$\underbrace{m\cdot\vec{a'}}_{=0} = \vec{F} - m\vec{A}$$

$$F = T(-\sin\beta\,\vec{i} + \cos\beta\,\vec{j}) + mg\,(\sin\alpha\,\vec{i} - \cos\alpha\,\vec{j})$$

NAŽALOST OVO JE SVE ŠTO IMAM U BILJEŽNICI, A SJEĆAM SE DA NI ON SAM NIJE ZNAO ŠTO RADI.

6.



$$a = A - a'$$

$$\underbrace{I\cdot\alpha'}_{\vec{M}} = \underbrace{I\cdot\frac{a'}{R}}_{} = \underbrace{R\cdot m\cdot A}_{\text{sila}\times\text{krak}}$$

$$I_{CM} = \frac{2}{5}mR^2$$

$$I = I_{CM} + mR^2 = \frac{7}{5}mR^2$$

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

$$\alpha = \frac{a}{r}$$

$$I\cdot\alpha = R\cdot m\cdot A$$

$$I\cdot\frac{a'}{R} = R\,m\,A$$

$$\frac{7}{5}\cancel{m}R^{\cancel{2}}\frac{a'}{\cancel{R}} = \cancel{R}\,\cancel{m}\,A$$

$$\frac{7}{5}a' = A$$

$$a' = \frac{5}{7}A$$

$$a = A - a' = \left(1 - \frac{5}{7}\right)A = \frac{2}{7}A$$

7)

$$W = \mathcal{Q} \cdot U = E - mc^2$$

$$E = \gamma mc^2$$

$$E = \mathcal{Q} \cdot U + mc^2 = \gamma mc^2$$

$$\gamma = \frac{\mathcal{Q} \cdot U}{mc^2} + 1$$

$$\frac{1}{\sqrt{1-\beta^2}} = \frac{\mathcal{Q} \cdot U + mc^2}{mc^2}$$

$$1-\beta^2 = \left(\frac{mc^2}{\mathcal{Q} U + mc^2}\right)^2$$

$$\beta = \sqrt{1 - \left(\frac{mc^2}{\mathcal{Q} U + mc^2}\right)^2}$$

$$p = \gamma \cdot m \cdot v$$

$$v = c \cdot \sqrt{1 - \left(\frac{mc^2}{\mathcal{Q} \cdot U + mc^2}\right)^2}$$

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8)

$$\frac{\Delta t}{\Delta t_0} = 2$$

dilatacija vremena

vlastito vrijeme

$$\Delta t = \frac{\Delta t_0}{\sqrt{1-\beta^2}}$$

$$\frac{\Delta t}{\Delta t_0} = \frac{1}{\sqrt{1-\beta^2}}$$

$$1-\beta^2 = \frac{1}{4}$$

$$\beta^2 = 1 - \frac{1}{4} = \frac{3}{4}$$

$$\beta = \frac{\sqrt{3}}{2}$$

$$v = c\sqrt{1 - \left(\frac{\Delta t_0}{\Delta t}\right)^2}$$

$$v = \frac{\sqrt{3}}{2} c$$

MISLIM DA JE OVAKO.
IPAK NIJE.
NEMAM POJMA ŠTO SU ONI RADILI.
BTW NJIHOVO RJEŠENJE IMA C VIŠKA. ONAJ POD KORIJENOM

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9. NIJE RJEŠAVAO.