Zg, kinematika nal. 6

$v = k\sqrt{t}$

$k = 5\ \frac{m}{s^{\frac{3}{2}}}$

a) $a(t=30s) = ?$

b) $s(t=30s) = ?$

c) $a(t=0) = ?$

a) $a = \frac{dv}{dt} = (k\sqrt{t})' = \frac{k}{2\sqrt{t}}$

$a(t=30s) = \frac{k}{2\sqrt{30s}} = \ldots =$

b) $\frac{ds}{dt} = v \Rightarrow ds = v\,dt \quad / \int$

$\int_0^s ds = \int_0^t k\sqrt{t}\,dt$

$s = k \cdot \frac{t^{\frac{3}{2}}}{\frac{3}{2}} = \frac{2k}{3} \cdot t^{\frac{3}{2}}$

$s(t) = \frac{2k}{3} t^{\frac{3}{2}}$

c) $\lim_{t \to 0} \frac{k}{2\sqrt{t}} = \frac{k}{2\sqrt{0}}$ //

$\lim_{t \to 0} \frac{k}{2\sqrt{t}} = \infty$ Ne rabi nas skrbeti, saj to velja le v $t=0$

8. Kamen vržemo navpično navzgor z začetno hitrostjo $v_0 = 10 \frac{m}{s}$, iz kolikšne višine h_0 moramo spustiti drug kamen, da se oba srečata na polovični višini? Kolikšen čas preteče med trenutkoma, ko pade ta kamna na tla?

$y_1 = -\frac{gt^2}{2} + v_0 t$ - kose srečata: $y_1 = y_2 = \frac{h_0}{2}$

$y_2 = -\frac{gt^2}{2} + h_0$ $\quad -\frac{gt'^2}{2} + v_0 t' = -\frac{gt'^2}{2} + h_0$

Vstavimo v 1 enačbo $\quad t' = \frac{h_0}{v_0}$

$$\frac{h_0}{2} = -\frac{g\left(\frac{h_0}{v_0}\right)^2}{2} + h_0$$

$$+\frac{h_0}{2} = +\frac{g}{2}\frac{h_0^2}{v_0^2} \Rightarrow h_0 = \frac{v_0^2}{g}$$

še čas, ko pade na tla.

$y_1 = 0$ $\quad y_2 = 0$

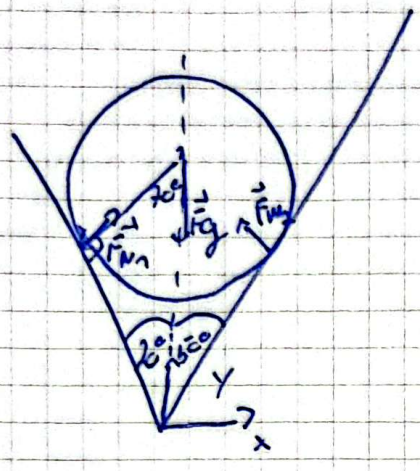
$-\frac{gt^2}{2} + v_0 t = 0$ $\quad -\frac{gt^2}{2} + h_0 = 0$

$\left(-\frac{gt}{2} + v_0\right) t = 0$ $\quad t^2 = \frac{2h_0}{g} = \frac{2v_0^2}{g^2}$

$t_1 = 0$ $\quad t_2 = \frac{2v_0}{g}$ $\quad t = \pm\sqrt{2}\frac{v_0}{g}$

- ni smiselno, ker ne more skozi tla

75. Prva stena vodoravnega žleba je nagnjena za 20° proti vodoravnici, druga stena pa za 50° (slika 6). S kolikšnima silama delujeta steni žleba na miško 30N težko kroglo



$$\vec{F}_g + \vec{F}_{N_1} + \vec{F}_{N_2} = 0$$

$$\vec{F}_g = (0, -F_g)$$

$$\vec{F}_{N_1} = F_{N_1}(\cos(20^\circ), \sin(20^\circ))$$

$$\vec{F}_{N_2} = F_{N_2}(-\cos(50^\circ), \sin(50^\circ))$$

$$\vec{F}_g + \vec{F}_{N_1} + \vec{F}_{N_2} = 0$$

$$0 = (0, -F_g) + F_{N_1}(\cos(20^\circ), \sin(20^\circ)) + F_{N_2}(-\cos(50^\circ), \sin(50^\circ))$$

$$F_{N_1}\cos(20^\circ) = F_{N_2}\cos(50^\circ)$$

$$F_g = F_{N_1}\sin(20^\circ) + F_{N_2}\sin(50^\circ)$$

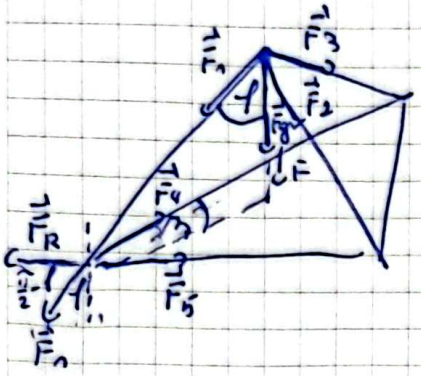
$$F_g = F_{N_2}\tan(20^\circ)\cos(50^\circ) + F_{N_2}\sin(50^\circ)$$

$$F_{N_2} = \frac{F_g}{\tan(20^\circ)\cos(50^\circ) + \sin(50^\circ)} = \frac{F_g}{\tan(50^\circ)\cos(20^\circ) + \sin(20^\circ)}$$

$$F_{N_1} = \frac{F_g}{\tan(20^\circ)\cos(50^\circ) + \sin(50^\circ)} \cdot \frac{\cos(50^\circ)}{\cos(20^\circ)}$$

$$= \frac{F_g}{\frac{\sin(20^\circ)}{\cos(20^\circ)}\cos(50^\circ) + \frac{\cos(50^\circ)}{\cos(20^\circ)} \cdot \tan(50^\circ)\cdot\cos(20^\circ)} = \frac{\frac{\cos(50^\circ)}{\cos(20^\circ)}}{}$$

5. Stojalo v obliki tetraedra je sestavljeno iz šestih po 2 m dolgih iz tankih palic. Na vrh stojala privežemo 100 N težko utež. Kolikšno silo moro prenesti vsaka od treh nožic in kolikšno vsaka od treh vodoravnih?



$$\vec{F}_g + \vec{F}_1 + \vec{F}_2 + \vec{F}_3 = 0$$

$$F_g = 3 F_{proj} \qquad F_{proj} = F_1 \cos(\alpha)$$

$$F_1 = F_2 = F_3$$

$$F_R = F_1 \cos\left(\frac{\pi}{2} - \alpha\right) = F_1 \sin(\alpha)$$

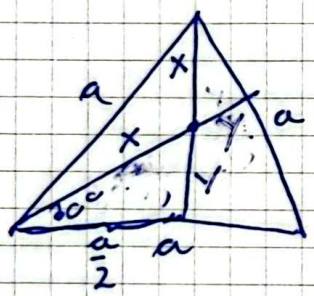
$$F_4 = F_5$$

$$F_R = 2 F_{proj\,2} \qquad F_{proj\,2} = F_4 \cos(\beta)$$

$$\underline{F_1 = \frac{F_g}{3\cos(\alpha)}}$$

$$F_4 = \frac{F_{proj\,2}}{\cos(\beta)} = \frac{F_R}{2\cos(\beta)} = \frac{F_1 \sin(\alpha)}{2\cos(\beta)} =$$

$$= \frac{F_g \sin(\alpha)}{6\cos(\beta)\cos(\alpha)} = \underline{\frac{F_g \tan(\alpha)}{6\cos(\beta)}} = F_4$$

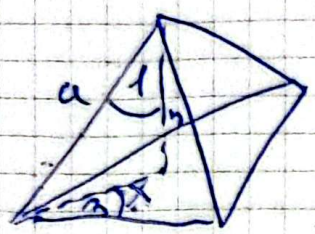


$$\cos(30^\circ) = \frac{\frac{a}{2}}{X} \Rightarrow X = \frac{a}{2\cos(30^\circ)}$$

$$\underline{X = \frac{a}{\sqrt{3}}}$$

$$\sin(30^\circ) = \frac{Y}{X} \Rightarrow Y = \sin(30^\circ) \cdot X =$$

$$= \sin(30^\circ) \cdot \frac{a}{2\cos(30^\circ)} = \frac{a}{2}\tan(30^\circ) = \underline{\frac{a}{2\sqrt{3}}}$$



$$h^2 = a^2 - x^2$$

$$h = \sqrt{a^2 - \frac{a^2}{3}} = a\sqrt{\frac{2}{3}}$$

$$\cos(\varphi) = \frac{h}{a} = \sqrt{\frac{2}{3}}$$

$$\beta = \frac{\pi}{6}$$

$$F_1 = \frac{F_g}{3\cos(\varphi)} = \frac{F_g}{\sqrt{6}}$$

$$F_4 = \frac{F_g \tan(\varphi)}{6\cos(\beta)} = \frac{F_g}{6}\frac{1}{\sqrt{2}}\frac{2}{\sqrt{3}} = \frac{F_g}{6}\sqrt{\frac{2}{3}} = F_1\sqrt{\frac{2}{18}}$$

$$\sin^2(\varphi) = 1 - \cos^2(\varphi)$$

$$= 1 - \frac{2}{3} = \frac{1}{3} \Rightarrow \sin(\varphi) = \frac{1}{\sqrt{3}}$$

$$\tan(\varphi) = \frac{\sin(\varphi)}{\cos(\varphi)} = \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{2}} = \frac{1}{\sqrt{2}}$$

$$\cos(\beta) = \frac{\sqrt{3}}{2}$$