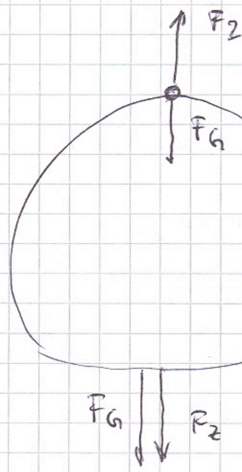
Physik, TBM 3E

(1) Oben: $F_Z = F_G$ resp. $a_Z = g$

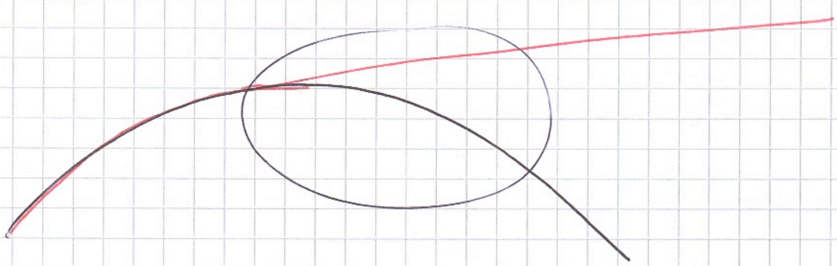


$F_Z + F_G = 0$

$\longrightarrow a = 2g$

$$F_G = 2mg = 2 \cdot 9.81 \cdot 5 = \underline{\underline{98.1\,N}}$$

(2)



Ohne Reibung fährt Auto geradlinig voraus; es verlässt die Strasse <u>tangential</u> zur Kurve.

(3)

$$F_Z = F_{Reib}$$

$$m\frac{v^2}{R} = f \cdot m \cdot g \quad (= \mu \cdot m \cdot g \text{ mit } f = \mu)$$

$$\frac{v^2}{R} = \mu \cdot g$$

$$v^2 = R\mu g$$

$$v = \sqrt{R\mu g}$$

$\mu_H = 0.56$: $\quad v \cong \underline{\underline{16.57\,m/s \cong 59.7\,km/h}}$

$\mu_H = 0.68$: $\quad v \cong \underline{\underline{18.26\,m/s \cong 65.75\,km/h}}$

(4)

$$a_Z = \omega^2 R\,; \quad R = R_{Erde}$$

$$\omega = \frac{2\pi}{T}\,; \quad T = 24h = 24 \cdot 3600\,s$$

$$\underline{\underline{a_Z = 0.0336\,m/s^2}} \qquad \underline{\underline{0.0337\,m/s^2}}$$

(5)

$$F_Z = F_G \qquad \frac{mv^2}{R} = \frac{GmM}{R^2}$$

$$\cancel{m}\omega^2 R = G\frac{\cancel{m}M}{R^2} \qquad v = \sqrt{\frac{GM}{R}}$$

$$\omega^2 R = \frac{GM}{R^2}$$

$$\omega = \sqrt{\frac{GM}{R^3}} \qquad \omega = \frac{2\pi}{T}$$

$$\frac{T}{2\pi} = \sqrt{\frac{R^3}{GM}} \Rightarrow T = 2\pi\sqrt{\frac{R^3}{GM}} \quad 1{,}81h$$

$$\cong \cancel{1034.67\,s} \; 6501\,s$$

$$= \underline{\underline{17.24\,Min.}}$$

$$v = \omega R$$

$$= R \cdot \sqrt{\frac{GM}{R^3}}$$

$$= \sqrt{\frac{GM}{R}} = 1'679.95\,m/s \cong \underline{\underline{6'047.8\,km/h}}$$

(6) $F_Z = F_G$

$$\frac{mv^2}{R} = G\frac{mM}{R^2}$$

$$v = \sqrt{\frac{GM}{R}}$$

Je höher der Satellit, umso langsamer ist er.
E_{kin} nimmt zwar ab, aber E_{pot} nimmt zu.
Insgesamt nimmt die Energie zu

(7) "oben" gilt: $\frac{v^2}{R} = g \Rightarrow v^2 = Rg$

$$v = \sqrt{Rg}$$

$$mg(h-2R) = \cancel{\sqrt{Rg}}\ \frac{1}{2}mv^2 = \frac{1}{2}mRg$$

$$\cancel{mg}h - 2\cancel{mg}R = \frac{1}{2}\cancel{m}R\cancel{g}$$

$$h - 2R = \frac{1}{2}R$$

$$h = 2.5R$$