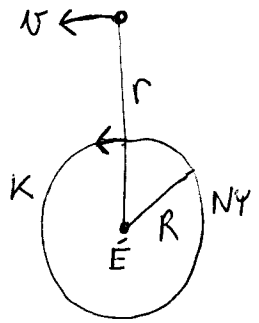
14.)



$R = 6370\,km$ (i) $r = ?$ (ii) $v = ?$

$T = 24h = 86400s$

$\omega = \frac{2\pi}{T}$ $\quad v = \frac{2r\pi}{T}$ $\quad F_G = G\frac{Mm}{r^2}$ $\quad a_{cp} = \frac{v^2}{r}$ $\quad \vec{a} = \frac{\vec{F_e}}{m}$ $\quad a_{cp} = \omega^2 r$

(i)

$$F_e = F_G = \frac{GMm}{r^2} = m\omega^2 r$$

Felszínen: $G\frac{Mm}{R^2} = mg$

$$GM = R^2 g$$

$$GM = r^3\frac{4\pi^2}{T^2}$$

$$R^2 g = r^3\frac{4\pi^2}{T^2}$$

$$r = \sqrt[3]{\frac{R^2 g T^2}{4\pi^2}} = \left(\frac{10 \cdot 6370000^2 \cdot 86400^2}{4\pi^2}\right)^{1/3} = \underline{42\,493\,km}$$

(ii)

$$v = \frac{2r\pi}{T} = \frac{2 \cdot 42493000 \cdot \pi}{86400} = \underline{3090{,}2\,\frac{m}{s}} = 11125\,\frac{km}{h}$$