Esercizio 1

$(x_i, y_i) = (0\,m, 0\,m)$

$x_f = 130\,m$

$y_f = 20.0\,m$

$x_f = x_i + v_{xi} t = v_i t \cos 35.0°$

$v_i t \cos 35.0° = 130\,m \Rightarrow v_i t = 158.7\,m$

$y_f = v_{yi} t - \frac{1}{2} g t^2$

$y_f = (v_i \operatorname{sen} 35.0°) t - \frac{1}{2} \cdot (9.80\,m/s^2) \cdot t^2$

(usando $v_i t = 158.7\,m$)

$\Rightarrow t = \sqrt{\frac{71.0\,m}{4.90\,m/s^2}} = 3.81\,s$ (b)

$v_i = 41.7\,m/s$ (a)

Esercizio 2

$h = 6\,m$

$r = 2\,m$

$mgh = \frac{1}{2} m v_f^2 + mg 2r$ $= 6.26\,m/s$

$v_f = \sqrt{2g(h - 2r)} = \sqrt{2g(r)}$ $(h = 3r)$

$a = v^2/r = 19.6\,m/s^2$

$m \frac{v_f^2}{r} = mg + N$

$N = \frac{2m}{r}(h - 2r)\, mg = mg\left(\frac{2h}{r} - 4 - 1\right)$

v_f^2

$= mg\left(\frac{2h}{r} - 5\right)$

$h = 3r$

$N = \frac{2m}{r}(g \cdot 3r - 2rg) - mg =$ $= 9.8\,N$ $9.8\,m/s^2$

$= \frac{2m}{r} \cdot g \cdot r - mg = 9.8\,N$ $9.8\,N$

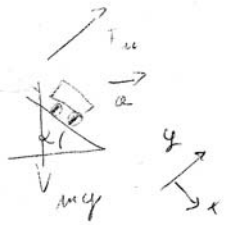
n°2

$mg\left(\frac{2h}{2} - 4 - 1\right) = mg\left(\frac{2h}{r} - 5\right) =$

$= 1 \cdot 9.8 \cdot \left(\frac{2.6}{2} - 5\right) = 9.8 \cdot 1 =$

$= 9.8\,N$

Esercizio 3



$$\frac{mv^2}{R}\cos\vartheta = mg\sin\vartheta$$

$R = 200\ m$

$v = 50\ km/h$

$$\begin{cases} x: N\sin\alpha = m\dfrac{v_p^2}{R} \\ y: N\cos\alpha = mg \end{cases}$$

$$\frac{\sin\alpha}{\cos\alpha} = \frac{v_p^2}{gR}$$

$$\alpha = \arctan\frac{v_p^2}{gR} = \frac{(50\times10^3/3600)^2}{9.8\cdot200} = 23.26^\circ \quad \not{23.26^\circ}\ 5.6^\circ$$

Esercizio 4

$$\vartheta(t) = A\cos\omega t$$

$$v_{max} = \frac{d\vartheta}{dt} = A\omega = 0.073\ rad/s$$

$$\Rightarrow \left(\omega = \sqrt{\frac{g}{L}} = 0.52\ Hz\right)$$

$$A = 0.14\ rad$$

$$T = \frac{2\pi}{\omega} = 12.08\ s$$

$$a_{max} = A\omega^2 = 0.14\cdot(0.52)^2\ \frac{rad}{s^2} = 0.038\ \frac{rad}{s^2}$$

$v = 26000$ km/h

Esercizio 5

a) $F = \frac{G m_s M_T}{r^2} = \frac{m_s v^2}{r}$

$$r = \frac{G M_T}{v^2} = \frac{6.67 \times 10^{-11} \cdot 5.98 \times 10^{24}}{(26000 \times 10^3 / 3600)^2}$$

$$= 7.65 \times 10^6 \text{ m}$$

$$h = r - R_T = 7.65 \times 10^6 - 6.38 \times 10^6 = 1.267 \times 10^6 \text{ m}$$

b) $T = \frac{2\pi}{\omega}$ $\omega = \frac{v}{r} = 0.0010 \text{ s}^{-1}$

$= 1.74$ h (6652 s)

c) $G m_{sat} M$