Problem 1, (1-05-22)

$$\bar{F}_1 = \frac{75\,N}{\sqrt{2}}(1,-1)$$

$$\bar{F}_1 + \bar{F}_2 + \bar{F}_3 = 0 \qquad \bar{F}_2 = \frac{150\,N}{\sqrt{2}}(1,-1)$$

$$\rightarrow \bar{F}_3 = -\bar{F}_1 - \bar{F}_2 = \frac{N}{\sqrt{2}}(-75-150,\ 75+150)$$

$$= \frac{225\,N}{\sqrt{2}}(-1,1)$$

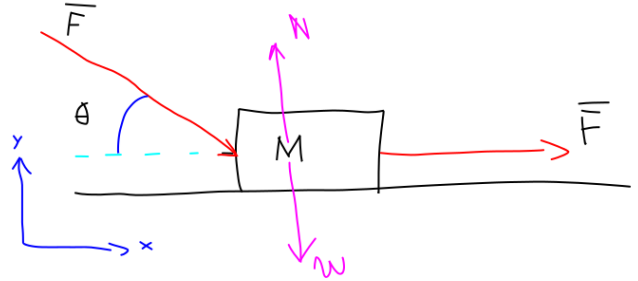


Problem 2, (1-05-40)

$M = 10\,kg$ , $|\bar{F}| = 30\,N$

$\theta = 30^\circ$

Find $\bar{a}$ for M




I add the forces N and w to realize that the y-component of F (on the left) ballances with them

(y:) $N - w - F_y = 0 \rightarrow N = w + F\sin\theta$

$= mg + F\sin\theta$



(x:) $(F_{net})_x = F\cos\theta + F = F(1+\cos\theta)$

$\bar{F}_{net} = M\bar{a} \rightarrow a_x = \frac{F(1+\cos\theta)}{M}$

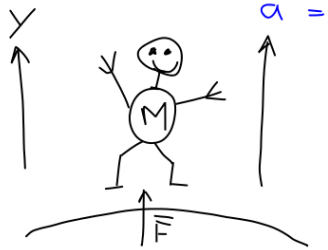
$$= \frac{30\,N\left\{1+\cos\left(\frac{30\pi}{180}\right)\right\}}{10\,kg}$$

$= 5{,}6\ m/s^2$



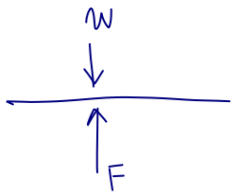
Problem 3, (1-05-58)

Find F that gave her this initial a on the trampoline




$\bar{a} = 7{,}5\ m/s^2$

$M = 45\,kg$



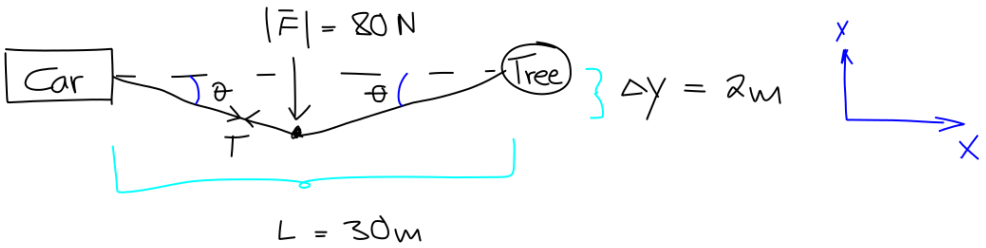

$F - w = F_{net} = Ma$

$\rightarrow F - Mg = Ma$

$\rightarrow F = M(a+g) = 779\ N$

Problem 4, (1-05-64)

Find the force on the car, T




Find θ

$$\tan\theta = \frac{\Delta y}{L/2} = \frac{2\Delta y}{L}$$

$$\rightarrow \theta = \arctan\left(\frac{2\Delta y}{L}\right)$$



x:

$$(F_{net})_x = (T_R)_x - (T_L)_x = 0$$

$$\rightarrow (T_R)_x = (T_L)_x$$

$$T_L\cos\theta = T_R\cos\theta \rightarrow T_L = T_R$$

y:

$$(F_{net})_y = (T_l)_y + (T_R)_L - F = 0$$

$$0 = T\sin\theta + T\sin\theta - F$$

$$\rightarrow T = \frac{F}{2\sin\theta} = \frac{F}{2\sin\left(\arctan\left(\frac{2\Delta y}{L}\right)\right)}$$



$$\arctan x = \arcsin\left[\frac{x}{\sqrt{1+x^2}}\right]$$

$$\rightarrow T = \frac{F}{2\sin\left[\arctan\left(\frac{2\Delta y}{L}\right)\right]}$$

$$= \frac{F\sqrt{1+\left(\frac{2\Delta y}{L}\right)^2}}{2\left(\frac{2\Delta y}{L}\right)} \simeq 303\ N$$

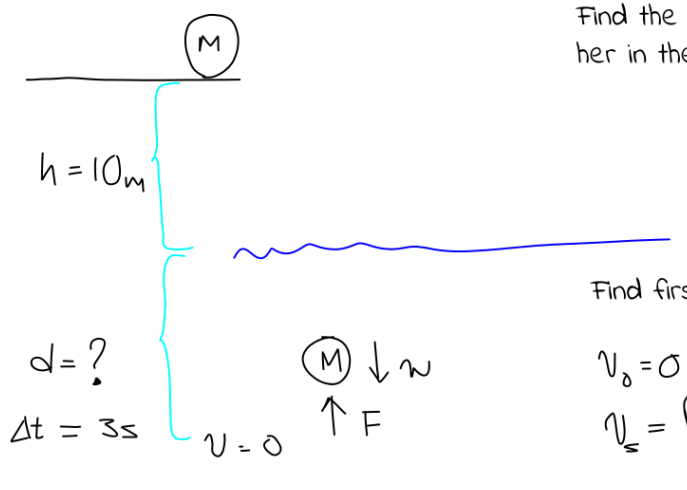


Problem 5, (1-05-76)

No air resistance

M = 80 kg

Find the average force stopping her in the water




Find first speed at surface

$v_0 = 0$

$v_s = \sqrt{2gh}$

Meðalhröðun

$$\langle \bar{a} \rangle = \frac{0 - \sqrt{2gh}}{\Delta t}$$

$$\rightarrow \langle \bar{F} \rangle = - M \frac{\sqrt{2gh}}{\Delta t}$$

$$= - 80 \cdot \frac{\sqrt{2 \cdot 9{,}81 \cdot 10}}{3} \approx 374\ \text{N}$$