Exercícios do Capítulo 5: (Halliday & Resnick)

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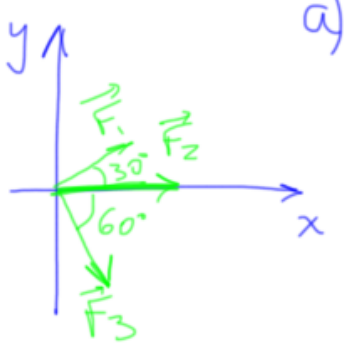

a = ?

a) em x:

$$\vec{F}_{Rx} = (32 \cdot \cos 30° + 55 + 41 \cdot \cos 60°)\,\hat{i}$$

$$\vec{F}_{Ry} = (32 \cdot \operatorname{sen} 30° + 0 - 41 \operatorname{sen} 60°)\,\hat{j}$$

$$\Rightarrow a_x = \frac{F_x}{m} \Rightarrow \vec{a}_x = \frac{103,2}{120}\hat{i} = 0,86\,\hat{i}\ m/s^2$$

$$a_y = \frac{F_y}{m} \Rightarrow \vec{a}_y = \frac{-19,5}{120} = -0,16\,\hat{j}\ m/s^2$$

b) $a = \sqrt{a_x^2 + a_y^2} = 0,87\ m/s^2$

c) $tg\theta = \frac{a_y}{a_x} \Rightarrow \theta = tg^{-1}\frac{a_y}{a_x} \Rightarrow \theta = -11°$

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$m = 0{,}15\,kg$

$x(t) = -13 + 2t + 4t^2 - 3t^3$

$\vec{F} = ?$

$t = 3{,}4\,s$

$$v = \frac{dx}{dt} = 2 + 8t - 9t^2$$

$$a = \frac{dv}{dt} = 8 - 18t$$

em $t = 3{,}4\,s \Rightarrow a = -53{,}2\ m/s$

$\Rightarrow \vec{F} = m \cdot \vec{a}$ como se movimenta em x:

$$\vec{F} = 0{,}15 \times (-53{,}2\,\hat{i}) = \boxed{-7{,}98\,\hat{i}\ N}$$

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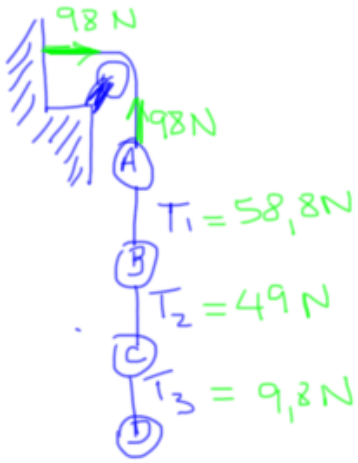

$$m_D \cdot g = T_3 \Rightarrow m_D = \frac{9{,}8}{9{,}8} = 1\,kg$$

$$(m_C + m_D) \cdot g = T_2 \Rightarrow m_C = 4\,kg$$

$$(m_B + m_C + m_D) \cdot g = T_1 \Rightarrow m_B = 1\,kg$$

$$(m_A + m_B + m_C + m_D) \cdot g = 98 \Rightarrow m_A = 4\,kg$$

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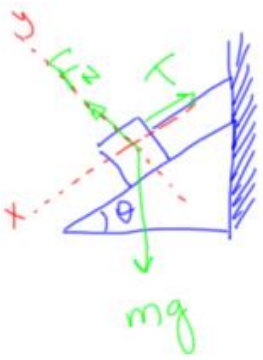

$m = 8{,}5\,kg$

$\theta = 30°$

a) em x: $mg\,\text{sen}\theta - T = 0$

$8{,}5 \times 9{,}8 \times \text{sen}\,30° = T = 41{,}7\,N$

b) em y: $F_N - mg\cos\theta = 0$

$F_N = 8{,}5 \times 9{,}8 \times \cos 30° = 72\,N$

c) se corda for cortada $T = 0$

em x: $F_R = \cancel{m}g\,\text{sen}\theta = \cancel{m}a$

$\Rightarrow a = 9{,}8 \times \text{sen}\,30° = 4{,}9\,m/s^2$

note que usei x positivo para a esquerda.

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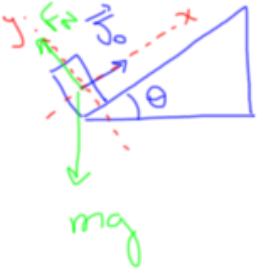

em x: $-mg\sin\theta = ma \Rightarrow a = -5{,}2\ m/s^2$

$v^2 - v_0^2 = 2a\Delta s \Rightarrow \Delta s = 1{,}18\ m$

b) $v = v_0 + at \Rightarrow t = \frac{-v_0}{a} = 0{,}62\ s$

c) $v_0 = 0$

$\Delta s = 1{,}18\ m$

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

$v^2 = v_0^2 + 2a\Delta s$

$v^2 = 2a\Delta s \Rightarrow v = 3{,}5\ m/s$

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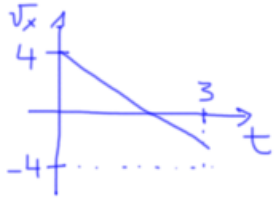

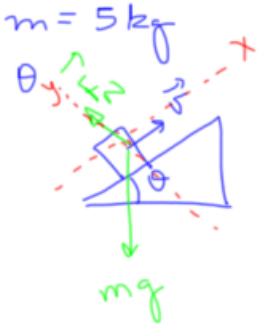

$a_x = \frac{\Delta v_x}{\Delta t} = -2{,}5\ m/s$

$F_N = mg\cos\theta$

$mg\sin\theta = ma \Rightarrow \sin\theta = \frac{a}{g}$

$\Rightarrow \theta = \sin^{-1}\frac{a}{g} = 14{,}8°$

$\Rightarrow F_N = 5 \times 9{,}8 \times \cos 14{,}8° = 47{,}4\ N$

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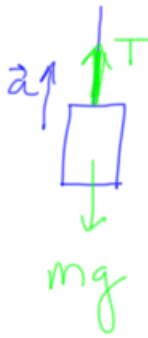

$m = 2000\ kg$

$a_{me} = -8\ m/s^2$

$T = ?$

a_{es} → aceleração do elevador em relação ao solo

a_{ms} → aceleração da moeda em relação ao solo

Para o elevador em relação ao solo:

$T - mg = ma \Rightarrow T = m(a+g)$

Para a moeda em relação ao solo:

$a_{ms} = a_{me} + a_{es}$

$\Rightarrow a_{es} = -9,8 + 8 = -1,8\ m/s^2$

$\Rightarrow T = 2000(-1,2 + 9,8) = 16.000\ N$

$\Rightarrow T = \underline{16\ kN}$

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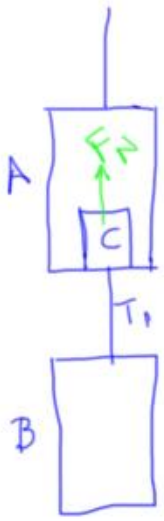

$m_A = 1.700\,kg$

$m_B = 1.300\,kg$

$m_C = 12\,kg$

$T_1 = 1{,}91 \times 10^4\,N$

$F_N = ?$

No elevador B:

$$-m_B \cdot g + T_1 = m_B a$$

$$\Rightarrow a = 4{,}9\ m/s^2$$

Na caixa do elevador A:

$$-m_c \cdot g + F_N = m_c \cdot a$$

$$\Rightarrow F_N = m_c (a + g)$$

$$\Rightarrow F_N = 176\ N$$

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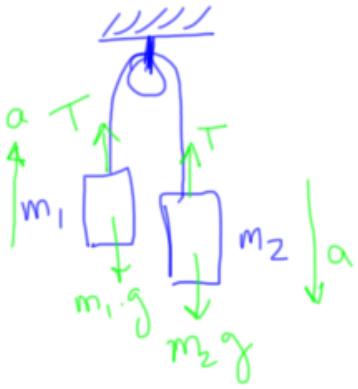

$m_1 = 1{,}3\,kg$

$m_2 = 2{,}8\,kg$

a) $T - m_1 \cdot g = m_1 a \Rightarrow T = m_1(a+g)$

$T - m_2 \cdot g = -m_2 a$

$\hookrightarrow m_1(a+g) - m_2 g = -m_2 a$

$\Rightarrow m_1 a + m_1 g - m_2 g = -m_2 a$

$\Rightarrow a(m_1 + m_2) = g(m_2 - m_1)$

$\Rightarrow a = g\dfrac{(m_2 - m_1)}{(m_1 + m_2)} = 3{,}6\,m/s^2$

b) $T = m_1 \cdot (a+g) = 17{,}4\,N$

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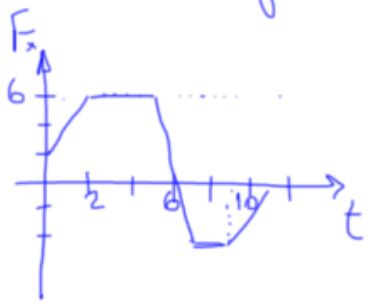
$m = 3\,kg$



$\vec{v}_0 = 3\,\hat{i}\ m/s$

$t = 11\,s$

a) $a = \frac{dv}{dt} \Rightarrow F = m\,\frac{dv}{dt}$

$\Rightarrow \int_{v_0}^{v} dv = \int_{0}^{11} \frac{F}{m}\,dt$

$= \frac{1}{m}\int_{0}^{11} F\,dt$ — área sob a curva

$\Rightarrow v - 3 = \frac{1}{3}\cdot 15 \Rightarrow v = 8\ m/s$

b) Como $v > 0 \Rightarrow$ movimento aponta para $+x$.