GABARITO – 1ºS.

1. $\vec{v}(t) = A\left(e^{\frac{t}{T}} - 1\right)\hat{x} + B\left(\frac{t}{T}\right)^2 \hat{z}$

(a) $\vec{a} = \frac{d\vec{v}}{dt} = \frac{A}{T} e^{\frac{t}{T}} \hat{x} + 2\frac{B}{T}\left(\frac{t}{T}\right)\hat{z}$

(b) $\vec{r} = \vec{r}_0 + \int_0^t \vec{v}(t')\,dt'$

$$\vec{r}(t) = \vec{r}_0 + \left[AT\left(e^{\frac{t}{T}} - 1\right) - At\right]\hat{x} + \frac{BT}{3}\left(\frac{t}{T}\right)^3 \hat{z}$$

(c) $A = 2\,m/s \quad B = 0{,}3\,m/s \quad T = 1\,s$

$\vec{r}_0 = 2\hat{x} + \hat{y} \qquad t_1 = 2\,s$

$$\vec{r}(2) = 2\hat{x} + \hat{y} + \left[2(e^2 - 1) - 4\right]\hat{x} + 0{,}1 \times 8\,\hat{z}$$

$$\vec{r}(t_1 = 2) = (2e^2 - 2 - 2)\hat{x} + \hat{y} + 0{,}8\,\hat{z}$$

$$\vec{r}(2) = 2e^2\hat{x} + \hat{y} + 0{,}8\hat{z} = 14{,}78\hat{x} + \hat{y} + 0{,}8\hat{z}$$

(d) $\langle\vec{v}\rangle = \frac{\Delta\vec{r}}{\Delta t} = \frac{(2e^2 - 2)}{2}\hat{x} + \frac{0{,}8}{2}\hat{z}$

$$\langle\vec{v}\rangle = (e^2 - 1)\hat{x} + 0{,}4\,\hat{z}$$

$\vec{v}(0) = 0 \qquad \vec{v}(2) = 2(e^2 - 1)\hat{x} + 0{,}3 \times 4\,\hat{z}$

$$\vec{v}(2) = 2(e^2 - 1)\hat{x} + 1{,}2\,\hat{z} = 12{,}78\hat{x} + 1{,}2\hat{z}$$

$\Delta K_{02} = K_2 - K_0 = \frac{1}{2} m v^2(2) - 0$

$v^2(2) = 4(e^2-1)^2 + 1,2^2 = 26,752 \ m^2/s^2$

$\frac{1}{2} m v^2(2) = 0,01 \times 26,76 = 0,268 \ J$

$W_{0\to} = 0,268 \ J$

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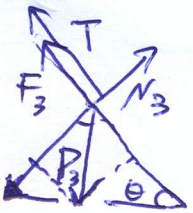
2. (a) $T = (M_1 + M_2)a$ (I)



$N_3 = P_3 \cos\theta = M_3 g \cos\theta$

$F_3 = \mu_c N_3 = M_3 g \mu_c \cos\theta$

$M_3 a = P_3 \sin\theta - T = M_3 g \sin\theta - T - M_3 g \mu_c \cos\theta$ (II)

Subst. (I)

$M_3 a = M_3 g \sin\theta - (M_1 + M_2)a - M_3 g \mu_c \cos\theta$

$(M_1 + M_2 + M_3)a = M_3 g (\sin\theta - \mu_c \cos\theta)$

$a = \frac{M_3 g (\sin\theta - \mu_c \cos\theta)}{(M_1 + M_2 + M_3)} = \frac{2 \times 10 \times (0,5 - 0,231 \frac{\sqrt{3}}{2})}{(0,4 + 0,6 + 2)}$

$a = \frac{20 \times 0,3}{3} = 2 \ m/s^2$

~~$T - a = 2 N$~~

$T = (M_1 + M_2)a = 1a = 2 \ N$