data fecha 04.02.21

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Exercícios Halliday - Movimento Retilíneo

1-

a) $V_1 = 30\ km/h$ $\Delta S_1 = 40\ Km$ $\Delta t_1 = 4/3\ h$

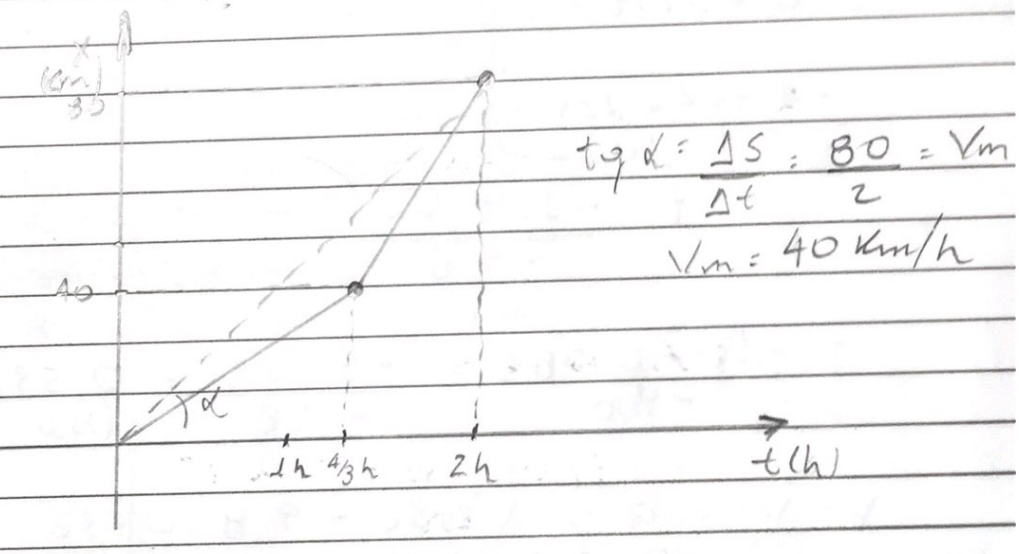
$V_2 = 60\ km/h$ $\Delta S_2 = 40\ Km$ $\Delta t_2 = 2/3\ h$

$\Delta S = 80\ Km$ $\Delta t = 4/3 + 2/3 = 6/3 = 2h$

$$V_m = \frac{\Delta S}{\Delta t} = \frac{80}{2} = 40\ km/h$$

b) Nesse caso $V_m = V_{escalar\ média} = 40\ km/h$

c)



$$tg\ \alpha = \frac{\Delta S}{\Delta t} = \frac{80}{2} = V_m$$

$V_m = 40\ km/h$

5-

a) $x = 3t - 4t^2 + t^3$

a) $t = 1$, $t = 2$, $t = 3$ e $t = 4$

$t = 1 \Rightarrow x = 3(1) - 4(1)^2 + (1)^3 = 3 - 4 + 1 = 0$

$t = 2 \Rightarrow x = 3(2) - 4(2)^2 + (2)^3 = 6 - 16 + 8 = -2\ m$

$t = 3 \Rightarrow x = 3(3) - 4(3)^2 + (3)^3 = 9 - 36 + 27 = 0$

$t = 4 \Rightarrow x = 3(4) - 4(4)^2 + (4)^3 = 12 - 64 + 64 = 12\ m$

b) $\Delta S = x(4) - x(0) = 12 - 0 = 12\ m$

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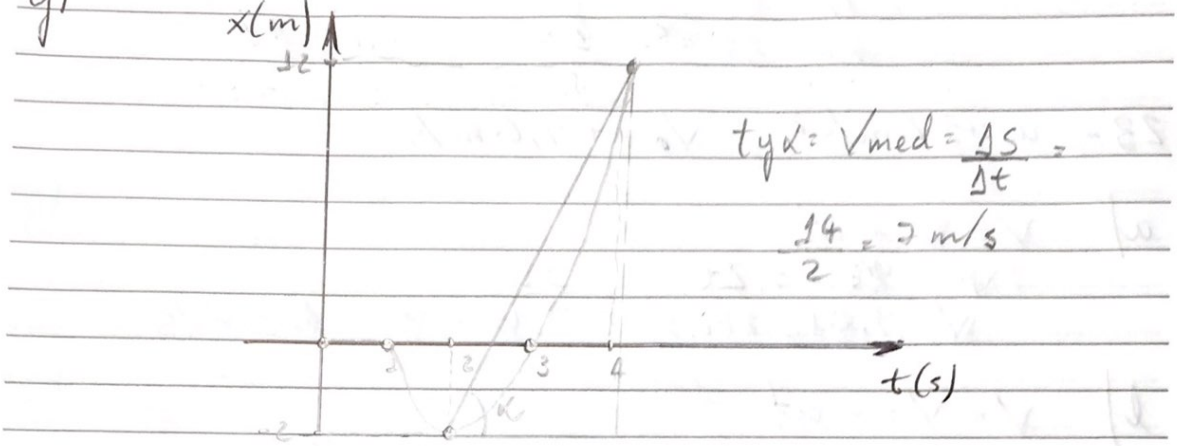
e) $V_m = \frac{\Delta S}{\Delta t} = \frac{12-(-2)}{4-2} = \frac{14}{2} = 7\ m/s$

g)



$tg\alpha = V_{med} = \frac{\Delta S}{\Delta t} = \frac{14}{2} = 7\ m/s$

15 - $x = 4 - 12t + 3t^2$ $\quad V(1) = ?$

a) $V(t) = \frac{dx}{dt} = -12 + 6t$

$V(1) = -12 + 6(1) = -6\ m/s$

b) Negativo

c) $V_{modulo} = |V| = 6\ m/s$

d) $a(1) = \frac{dV(1)}{dt} \Rightarrow \frac{dV}{dt} = 6\ m/s^2$

Como a aceleração é positiva e a velocidade negativa ela está reduzindo em módulo, logo a velocidade escalar está reduzindo.

e) Sim, pois a velocidade em 1 é negativa e a aceleração positiva (constante) logo a velocidade chegará a zero.

f) Não, pois velocidade e aceleração serão ambos positivos.

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19- $V_0 = 18\ m/s$ $\Delta t = 2,4\ s$ $V = -30\ m/s$ $a = ?$

$$a_m = \frac{\Delta V}{\Delta t} = \frac{-30 - 18}{2,4} = \frac{-48}{2,4} = -20\ m/s^2$$

23- $a = +3,2\ m/s^2$ $V_0 = +9,6\ m/s$

a) $V = V_0 + at$

$V = 9,6 + 3,2t$

$V = 9,6 + 3,2(-2,5) = 9,6 - 8 = 1,6\ m/s$

b) $V = V_0 + at$

$V = 9,6 + 3,2(2,5) = 9,6 + 8 = 17,6\ m/s$

27- $V_0 = 1,5 \cdot 10^5\ m/s$ $L = 1,00\ cm = 10^{-2}\ m$

$V_f = 5,7 \cdot 10^6\ m/s$ $a = ?$

$V^2 = V_0^2 + 2a \cdot \Delta s$

$(5,7 \cdot 10^6)^2 = (1,5 \cdot 10^5)^2 + 2a \cdot 10^{-2}$

$32,49 \cdot 10^{12} = 2,25 \cdot 10^{10} + 2a \cdot 10^{-2}$

$3249 \cdot 10^{10} - 2,25 \cdot 10^{10} = 2a \cdot 10^{-2}$

$3246,75 \cdot 10^{10} = 2a \cdot 10^{-2}$

$3246,75 \cdot 10^{12} = 2a$

$a = 1623,375 \cdot 10^{12} = 1,623375 \cdot 10^{15}\ m/s^2$

35- $x(2) = 6$ $x(1) = 0$, $x(0) = -2$

$S = S_0 + V_0 t + \frac{at^2}{2}$ $t = 1 \Rightarrow 0 = -2 + V_0(1) + \frac{a}{2}$

$t = 0 \Rightarrow -2 = S_0 + \cancel{V_0 t} + \cancel{\frac{at^2}{2}}$ $t = 2 \Rightarrow 6 = -2 + V_0(2) + \frac{4a^2}{2}$

$S_0 = -2\ m$

$$\begin{cases} 2V_0 + a = 4 \\ 2V_0 + 2a = 8 \end{cases} \Rightarrow a = 4\ m/s^2$$

sentido positivo

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45- $V_f = 24\ m/s$ $V_0 = 0$

a) $V^2 = V_0^2 + 2a \cdot \Delta s$

$-24^2 = 2(-9,8)\Delta s$

$\Delta s = \frac{-24 \cdot 24}{2 \cdot 9,8} = +29,387\ m$

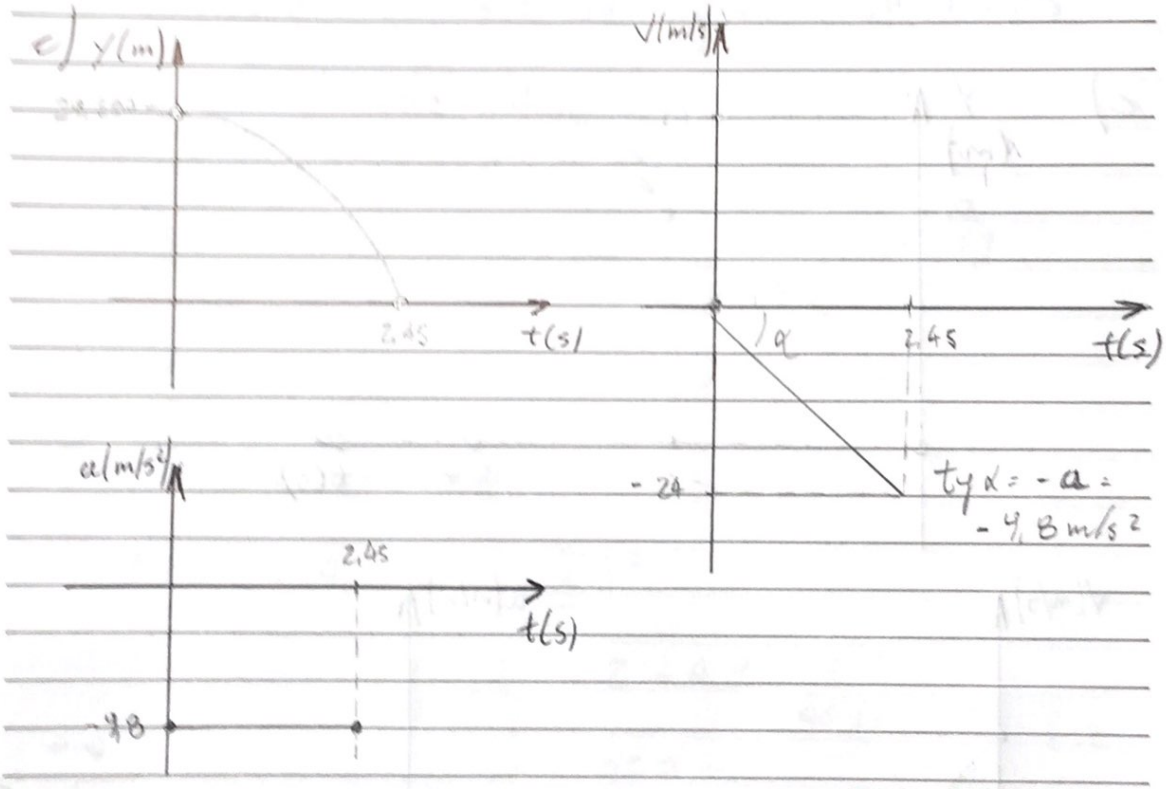
Deixou cair de 29,387 m

b) $V = V_0 + at$

$-24 = -9,8t$

$t = 2,45\ s$

c)



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47 - a) $Y_f = 50\,m$

$V^2 = V_0^2 + 2a \cdot \Delta S$

$0 = V_0^2 + (-19,6) \cdot 50$

$+V_0^2 = +980$

$V_0 \approx 31,30\ m/s$

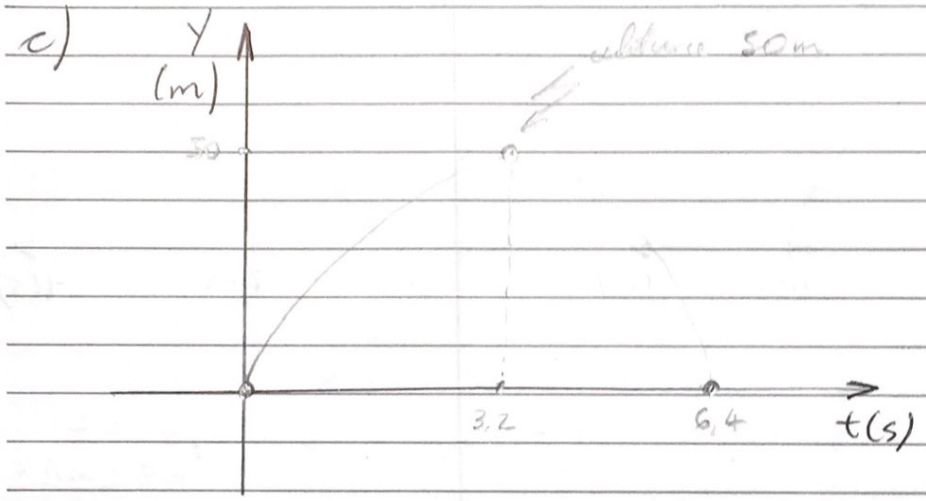
b) $V = V_0 + at$

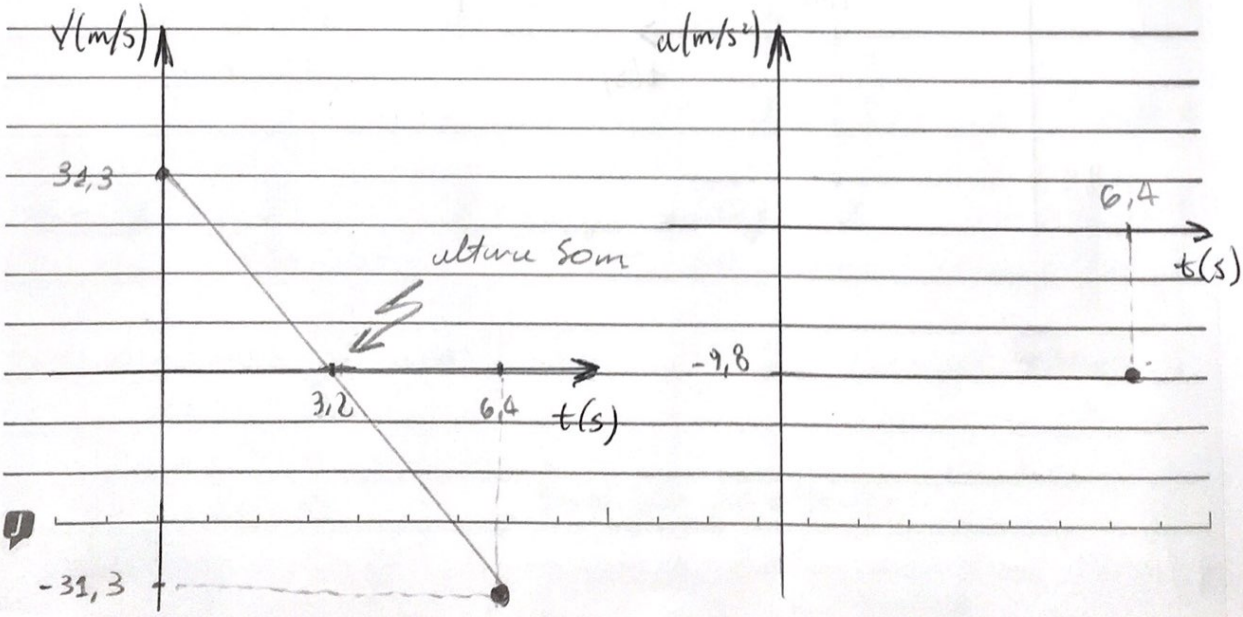
$0 = 31,30 - 9,8 \cdot t$

$t = \frac{31,30}{9,8} \approx 3,2\,s$

$2t = 6,4\,s$, tempo de subida e descida

c)





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59 - $h = 200cm = 2m$ $\quad a = -9,8\ m/s^2$

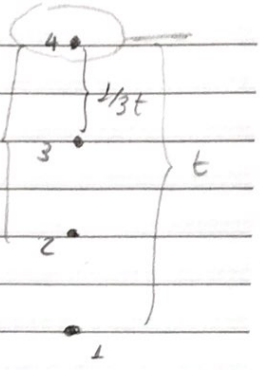
a) $S = S_0 + \cancel{v_0 t}^{0} + \frac{at^2}{2}$

$0 = +2 + \frac{(-9,8)t^2}{2}$

$-2 = -4,9t^2$

$t^2 = \frac{2}{4,9} \Rightarrow t_2 = \frac{\sqrt{2}}{\sqrt{4,9}}$

$t_1 = \frac{2}{3} t_2$



$S = S_0 - \cancel{v_0 t}^{0} + \frac{at^2}{2}$

$S = 2 + \frac{(-9,8)}{2} \cdot \left(\frac{2}{3} \cdot \frac{\sqrt{2}}{\sqrt{4,9}}\right)^2$

$S = 2 - 4,9 \cdot \left(\frac{4 \cdot 2}{9 \cdot 4,9}\right)$

$S = 2 - 4,9\left(\frac{8}{44,1}\right) = 2 - \left(\frac{39,2}{44,1}\right) = 1,111$

dist. durante = $2 - 1,111 \approx 0,888m$

b) $S = S_0 + \cancel{v_0 t}^{0} + \frac{at^2}{2}$ $\quad t_3 = \frac{1}{3} t$

$S = 2 + (-4,9) \cdot \left(\frac{1}{3} \cdot \frac{\sqrt{2}}{\sqrt{4,9}}\right)^2$

$S = 2 + (-4,9)\left(\frac{1}{9} \cdot \frac{2}{4,9}\right) = 2 - 4,9 \cdot \left(\frac{2}{44,1}\right)$

$S = 2 - \frac{9,8}{44,1} = 1,777\ m$

dist durante = $2 - 1,777 \approx 0,223\ m$