

Física 1 - Ficha S2

Movimento Unidimensional

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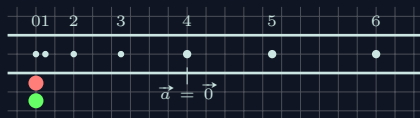
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Parte I

Questões

Questão 1

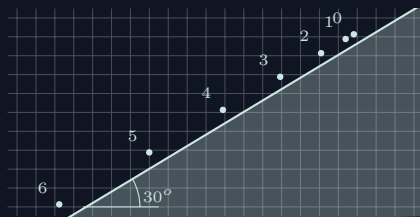
Q1 - a)



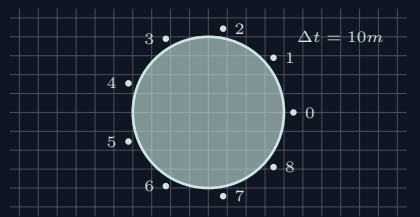
Q1 - b)



Q1 - c)



Q1 - d)



Questão 2

Q2 - a)

Movimento sobre superfície com atrito (movimento retilíneo com aceleração inversa ao movimento)

Q2 - b)

Queda livre (movimento retilíneo acelerado para baixo)

Q2 - c)

Movimento retilíneo uniforme para cima,
Movimento circular desacelerado,
movimento circular acelerado,
movimento retilíneo uniforme para esquerda.

Questão 4

Q4 - a)

t	2	4	6	10
x	10	20	20	40

Q4 - b)

$$v = \Delta S / \Delta t =$$

$$= (20 - 0) \text{ m} / (4 - 0) \text{ s} = 5 \text{ m/s}$$

Q4 - c)

$$v = \Delta S / \Delta t =$$

$$= (20 - 20) \text{ m} / (6 - 4) \text{ s} = 0 \text{ m/s}$$

Q4 - d)

$$v = \Delta S / \Delta t =$$

$$= (40 - 20) \text{ m} / (10 - 6) \text{ s} = 5 \text{ m/s}$$

Q4 - e)

$$v = \Delta S / \Delta t =$$

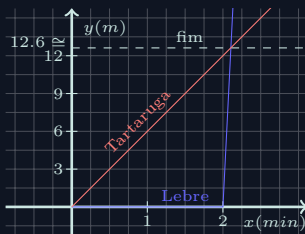
$$= (20 - 40) \text{ m} / (12 - 10) \text{ s} = -10 \text{ m/s}$$

Parte II

Problemas

Problema 1

P1 - a)



P1 - b)

$$\Delta t * \frac{10.0 \text{ cm}}{\text{s}} \frac{60}{100} - (\Delta t - 2) 20 * \frac{10.0 \text{ cm}}{\text{s}} \frac{60}{100} \Rightarrow \Delta t \cong 2.1 \text{ min}$$

P1 - c)

$$\Delta S = \Delta t * v_t = 2.1 * 6 \cong 12.6 \text{ m}$$

Problema 2

$$x_{(t)} = 2.0 + 3.0 t - 1.0 t^2$$

P2 - a)

P2 - c)

$$x_{(3)} = 2.0 + 3.0 * 3 - 1.0(3)^2 = 2.0 m \quad a_{(3)} = x''_{(3)} = -1.0 m/s^2$$

P2 - b)

$$v_{(3)} = x'_{(3)} = 3.0 + 2 * 3 = 9 m/s$$

Problema 3

P3 - a)

P3 - b)

$$\begin{aligned} \Delta t_{\min} a_{\max} &= |\Delta \vec{v}| = v_i \implies \iff \frac{a_{\max} (\Delta t_{\min})^2}{2} = \Delta S_{\max} < \\ &\implies \Delta t_{\min} = 100/5 = 20 s &< 0.80 K m \implies \frac{5 * (20)^2}{2} = 1000 m = \\ &= 1 K m \not\leq 0.8 K m \end{aligned}$$

Problema 4

P4 - a)

$$\begin{aligned} \Delta S &= a_0(t_0)^2/2 + v_1 t_1 + a_1(t_1)^2/2; \quad t_{Total} = t_0 + t_1; \\ v_1 = t_0 a_0 &\implies \Delta S = \frac{v_1}{t_{Total} - t_1} \frac{(t_{Total} - t_1)^2}{2} + v_1 t_1 + a_1(t_1)^2/2 = \\ &= \frac{10.0}{160 - 20} \frac{(160 - 20)^2}{2} + 10.0 * 20.0 - 5.00 * 10^{-2} (20.0)^2/2 \cong 890 m \end{aligned}$$

P4 - b)

Maria ganha $\iff t_M < t_J$; $t_M = t_0 + t_1$; $a_0 (t_0)^2/2 = l_1 \implies$
 $\implies \sqrt{2l_1/a_0} + t_1 = \sqrt{2 * 200/0.100} + 128 \cong 191 \text{ s} \not< 160 \text{ s}$
 \therefore João ganha

Problema 5

P5 - a)

$$\begin{aligned}\vec{a} &= \Delta \vec{v} / \Delta t; \Delta \vec{S} = \vec{v}_i \Delta t + \vec{a} (\Delta t)^2 / 2 \implies \vec{v}_i (\Delta v / a) + \vec{a} (\Delta v / a)^2 / 2 = \Delta \vec{S} \implies \\ &\implies \frac{\vec{a}}{a^2} \frac{(\Delta v)^2}{2} = \Delta \vec{S} - \vec{v}_i \Delta v / a \implies a^2 \hat{i} - a v_i \hat{i} \Delta v / \Delta S + a \hat{i} \frac{(\Delta v)^2}{2 \Delta S} = \vec{0} \implies \\ &\implies a \hat{i} \left(a + \frac{v_i \Delta v}{\Delta S} - \frac{(\Delta v)^2}{2 \Delta S} \right) = \vec{0} \implies \vec{a} = \frac{(\Delta v)(\Delta v - 2 v_i)}{2 \Delta S} \hat{i} = \\ &= \frac{(420 - 280)(420 - 280 - 2 * 420)}{2 * 0.10} = -490 \hat{i} \text{ K m/s}^2\end{aligned}$$

P5 - b)

$$\Delta t = \Delta v / a = \frac{420 - 280}{490 \text{ K}} \cong 286 * 10^{-6} \text{ s}$$

P5 - c)

$$\begin{aligned}\Delta \vec{S} &= \vec{v}_i \Delta t + \vec{a} (\Delta t)^2 / 2; \vec{a} = \Delta \vec{v} / \Delta t; \Delta \vec{v} = -\vec{v}_i \implies \\ &\implies \Delta S \hat{i} = \frac{v_i^2}{a} \hat{i} - \frac{v_i^2}{2 a} \hat{i} = \frac{v_i^2}{2 a} \hat{i} = \left(\frac{420^2}{2 * 490 \text{ K}} \right) \hat{i} \cong 18 \hat{i} \text{ cm}\end{aligned}$$

Problema 6

P6 - a)

$$\Delta t_{Total} = \Delta t_1 + \Delta t_2; \quad a_1 \Delta t_1 = a_2 \Delta t_2; \quad \Delta S = a_1 (\Delta t_1)^2/2 + v_2 \Delta t_2 - a_2 (\Delta t_2)^2/2;$$

$$\begin{aligned} v_2 = a_1 \Delta t_1 &\implies \Delta t_{Total} = \sqrt{\frac{2 a_2 \Delta S}{a_2 a_1 + a_1^2}} + \frac{a_1}{a_2} \sqrt{\frac{2 a_2 \Delta S}{a_2 a_1 + a_1^2}} = \\ &= \left(1 + \frac{0.100}{0.500}\right) \sqrt{\frac{2 * 0.500 * 1.00 \text{ K}}{0.500 * 0.100 + 0.100^2}} \cong 155 \text{ s}; \end{aligned}$$

$$\Delta t_1 = \sqrt{\frac{2 a_2 \Delta S}{a_2 a_1 + a_1^2}} = \sqrt{\frac{2 * 0.500 * 1.00 \text{ K}}{0.500 * 0.100 + 0.100^2}} \cong 129 \text{ s}$$