

data
fecha 25.03.21

D S T Q Q S S
D L M M J V S

CEFET/RJ - SISTEMAS DE INFORMAÇÃO

FÍSICA - PROF. PATRICIA MANZO

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1º PERÍODO - 2021.1

1ª AVALIAÇÃO FÍSICA

$$1 - x_1 = t^3 + 3t^2 + 5 \quad a_2 = -4t$$

$$v_1(0) = 3,2 \text{ m/s}$$

$$a) \quad v_1(t) = \left| \frac{dx_1}{dt} = 3t^2 + 6t \right|$$

$$b) \quad v_2(t) = \int a_2 dt = -2t^2 + C$$

$$v_2(0) = 3,2 \text{ logo}$$

$$-2(0)^2 + C = 3,2$$

$$C = 3,2$$

$$v_2(t) = -2t^2 + 3,2$$

$$c) \quad v_1(t) = v_2(t)$$

$$3t^2 + 6t = -2t^2 + 3,2$$

$$5t^2 + 6t - 3,2 = 0$$

$$\Delta = 36 + 64 = 100$$

$$t = \frac{-6 \pm 10}{10} = \frac{-16}{10} = -1,6 \text{ s}$$

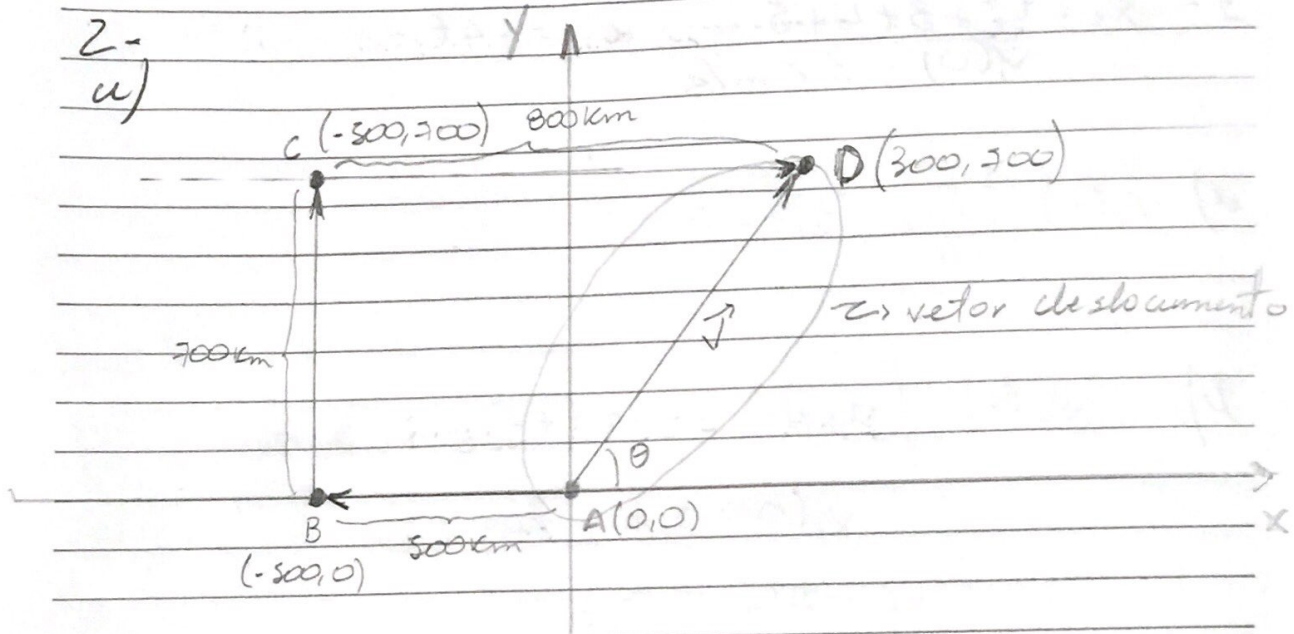
$$\frac{4}{10} = 0,4 \text{ s}$$

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Considerando $t \geq 0$ teremos apenas a
resposta $t = 0,4s$, caso considere $t \in (-\infty, +\infty)$
teremos como resposta $t = -1,6s$ e $t = 0,4s$

2-
a)



$$|\vec{r}| = \sqrt{(300-0)^2 + (700-0)^2} = \sqrt{40000 + 490000} =$$

$$\sqrt{530000} \approx 728,16 \text{ km}$$

$$b) \tan \theta = \frac{700}{300} = \frac{7}{3} \approx 2,33 \dots$$

$$\theta = \arctan(2,333 \dots) \approx 66,8^\circ$$

c) $\Delta t = 45 \text{ min} + 1 \text{ h} + 1 \text{ h } 15 \text{ min}$

$\Delta t = 3/4 \text{ h} + 1 \text{ h} + 1 \text{ h} + 15/60 \text{ h}$

$\Delta t = 2 \text{ h} + 3/4 \text{ h} + 1/4 \text{ h} = 2 \text{ h} + 1 \text{ h} = 3 \text{ h}$

$|\vec{v}_{\text{med}}| = \frac{|\vec{v}|}{\Delta t} = \frac{769,6}{3} \approx 253,8 \text{ km/h}$

Seu ângulo é o mesmo que o vetor \vec{v} , logo
 $\theta \approx 66,3^\circ$

d) $v_{\text{esc}} = \frac{\Delta S_T}{\Delta t}$

$\Delta S_T = 500 + 700 + 800 = 2000$

$v_{\text{esc}} = \frac{2000}{3} \approx 666,67 \text{ km/h}$

3- $\vec{a} = 3\hat{i} - 2\hat{j} + 4\hat{k}$ $\vec{b} = -5\hat{i} + 2\hat{j} - \hat{k}$
 $\vec{c} = 2\hat{i} + 3\hat{j} + 2\hat{k}$

a) $\vec{a} \cdot (\vec{b} \times \vec{c})$

$\vec{b} \times \vec{c} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -5 & 2 & -1 \\ 2 & 3 & 2 \end{vmatrix} = 4\hat{i} - 2\hat{j} - 15\hat{k} - 4\hat{k} + 3\hat{i} + 10\hat{j} = 7\hat{i} + 8\hat{j} - 19\hat{k}$

$\vec{a} \cdot (\vec{b} \times \vec{c}) = 21 - 16 - 76 = -71$

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$$b) \vec{a} \times (\vec{b} + \vec{c}) =$$

$$\vec{b} + \vec{c} = -3\hat{i} + 5\hat{j} + \hat{k}$$

$$\vec{a} \times (\vec{b} + \vec{c}) = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 3 & -3 \\ 3 & -2 & 1 \end{vmatrix} = -2\hat{i} - 12\hat{j} + 15\hat{k} - 6\hat{k} - 20\hat{i} - 3\hat{j} =$$

$$\boxed{-22\hat{i} - 15\hat{j} + 9\hat{k}}$$

$$c) (\vec{a} + \vec{b}) \cdot (\vec{a} \times 4\vec{c})$$

$$(\vec{a} + \vec{b}) = -2\hat{i} + 0\hat{j} + 3\hat{k}$$

$$4\vec{c} = 8\hat{i} + 12\hat{j} + 8\hat{k}$$

$$(\vec{a} \times 4\vec{c}) = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 3 & -3 \\ 8 & 12 & 8 \end{vmatrix} =$$

$$-16\hat{i} + 32\hat{j} + 36\hat{k} + 16\hat{k} - 48\hat{i} - 24\hat{j} =$$

$$-64\hat{i} + 8\hat{j} + 52\hat{k}$$

$$(\vec{a} + \vec{b}) \cdot (\vec{a} \times 4\vec{c}) = (-2\hat{i} + 0\hat{j} + 3\hat{k}) \cdot (-64\hat{i} + 8\hat{j} + 52\hat{k}) =$$

$$128 + 0 + 156 = \boxed{284}$$

4- 1500 rpm $r = 0,3 \text{ m}$ $\pi = 3,14$

a) $\Delta s = 2\pi R = 2 \cdot 0,3 \cdot \pi = 1,884 \text{ m}$

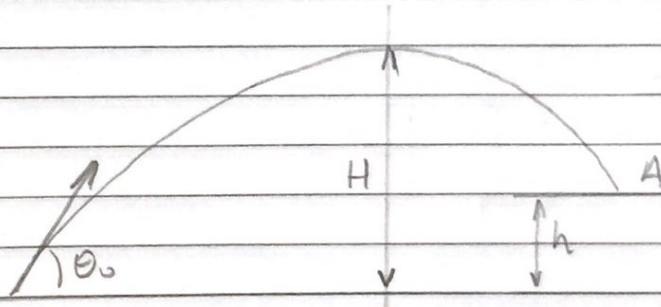
b) 1500 vueltas - 60s
1 vuelta - x s

$x = \frac{60}{1500} = \frac{6}{150} = 0,04 \text{ s}$

$v = \frac{2\pi R}{T} = \frac{1,884}{0,04} = 47,1 \text{ m/s}$

a) $|\vec{a}| = \frac{v^2}{R} = \frac{(47,1)^2}{0,3} = 7.394,70 \text{ m/s}^2$

5-



$v = 30 \text{ m/s}$
 $\theta_0 = 60^\circ$
 $t_a = 4 \text{ s}$
 $g = 10 \text{ m/s}^2$

a) $S = v_0 \sin \theta_0 t + \frac{at^2}{2}$

$S = 10 \cdot \sin 60 \cdot 4 - \frac{10 \cdot 16}{2}$

$S = 15\sqrt{3} \cdot 4 - 80$

$S = 60\sqrt{3} - 80$

$S = 23,9 \text{ m}$

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b) $v_{0x} = 30 \cdot \cos 60^\circ = 15 \text{ m/s}$

$$v_{0y}^2 = v_0^2 + 2a \cdot \Delta s$$

$$v_{0y}^2 = 20 \cdot (H - h)$$

$$v_{0y}^2 = 197$$

$$v_{0y} \approx 14 \text{ m/s}$$

$$|\vec{v}| = \sqrt{15^2 + 14^2} \approx 20,5 \text{ m/s}$$

c) $v_y = v \cdot \sin \theta = 30 \cdot \frac{\sqrt{3}}{2} = 15\sqrt{3}$

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

$$0 = (15\sqrt{3})^2 - 2 \cdot 10 \cdot H$$

$$675 = 20H \Rightarrow H = 33,75 \text{ m}$$