210	В-8	К1

$\begin{cases} x = 7\sin\left(\frac{\pi t^2}{6}\right) + 3 \text{ [см]} \\ y = 2 - 7\cos\left(\frac{\pi t^2}{6}\right) \text{ [см]} \\ t_1 = 1 \text{ [с]} \end{cases}$

1) Траектория
2) $\bar{V}_M$ – ?
3) $\bar{a}_M$ – ?
4) $\bar{a}^\tau$ и $\bar{a}^n$
5) ρ – ?

① $x = f(y)$

$(x-3)^2 = 49\sin^2\left(\frac{\pi t^2}{6}\right)$

$(y-2)^2 = 49\cos^2\left(\frac{\pi t^2}{6}\right)$

$(x-3)^2 + (y-2)^2 = 49$

$\begin{cases} x_0 = 3 \text{ (см)} \\ y_0 = -5 \text{ (см)} \end{cases}$

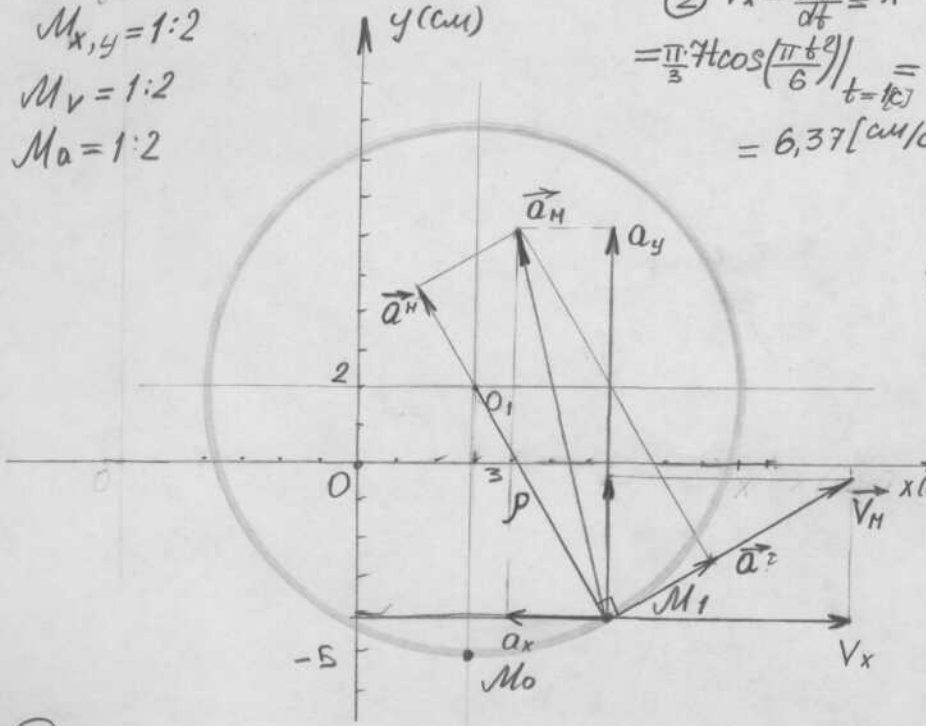
$x_1 = 7\sin\frac{\pi}{6} + 3 = 6{,}5 \text{ [см]}$

$y_1 = 2 - 7\cos\frac{\pi}{6} = 2 - 7\cdot 0{,}87 = -4{,}09 \text{ [см]}$.

$M_{x,y} = 1:2$

$M_V = 1:2$

$M_a = 1:2$



② $V_x = \frac{dx}{dt} = \dot{x} = \frac{\pi}{3}\cdot 7\cos\left(\frac{\pi t^2}{6}\right)\Big|_{t=1[c]} = \frac{7}{3}\cdot 3{,}14\cdot 0{,}87 =$

$= 6{,}37 \text{ [см/с]}$.

$V_y = \dot{y} = 7\cdot\sin\left(\frac{\pi t^2}{6}\right)\cdot\frac{\pi t}{3}\Big|_{t=1[c]} =$

$= \frac{7\cdot 3{,}14}{3}\cdot 0{,}5 = 3{,}66 \text{ [см/с]}$

$V_M = \sqrt{\dot{x}^2 + \dot{y}^2} =$

$= \sqrt{3{,}66^2 + 6{,}37^2} = 7{,}35 \text{ [см/с]}$.

③ $a_x = \ddot{x} = \dot{V}_x = \frac{7\pi}{3}\cos\frac{\pi t^2}{6} - \frac{7\pi^2 t^2}{9}\sin\frac{\pi t^2}{6}\Big|_{t=1(c)} = \frac{7\cdot 3{,}14}{3}\cdot 0{,}87 - \frac{7\cdot 3{,}14^2}{9}\cdot 0{,}5 =$

$= -2{,}56 \text{ [см/с}^2\text{]}$.

$a_y = \ddot{y} = \dot{V}_y = \frac{7\pi}{3}\sin\left(\frac{\pi t^2}{6}\right) + \frac{7\pi^2}{9}\cos\left(\frac{\pi t^2}{6}\right)\Big|_{t=1(c)} = \frac{7\cdot 3{,}14}{3}\cdot 0{,}5 + \frac{7\cdot 3{,}14^2}{9}\cdot 0{,}87 = 10{,}33 \left[\frac{\text{см}}{\text{с}^2}\right]$

$a_M = \sqrt{a_y^2 + a_x^2} = \sqrt{10{,}33^2 + 2{,}56^2} = 10{,}64 \text{ [см/с}^2\text{]}$

④ $a^\tau = \frac{dV}{dt} = \left|\frac{V_x a_x + V_y a_y}{V_M}\right| = \left|\frac{6{,}37\cdot(-2{,}56) + 3{,}66\cdot 10{,}33}{7{,}35}\right| = 2{,}93 \text{ [см/с}^2\text{]}$

$a^n = \sqrt{a^2 - (a^\tau)^2} = \sqrt{(10{,}64)^2 - (7{,}35)^2} = 7{,}69 \text{ [см/с}^2\text{]}$

⑤ $\rho = \frac{V_M^2}{a^n} = \frac{7{,}35^2}{7{,}69} = 7{,}02 = 7 \text{ [см]}$.

Ответ:

① $(x-3)^2 + (y-2)^2 = 49$

M_0 $\begin{cases} x_0 = 3 \text{ [см]} \\ y_0 = -5 \text{ [см]} \end{cases}$

M_1 $\begin{cases} x_1 = 6{,}5 \text{ [см]} \\ y_1 = -4{,}09 \text{ [см]} \end{cases}$

② $V_x = 6{,}37 \text{ [см/с]}$

$V_y = 3{,}66 \text{ [см/с]}$

$V_M = 7{,}35 \text{ [см/с]}$

③ $a_x = -2{,}56 \text{ [см/с}^2\text{]}$

$a_y = 10{,}33 \text{ [см/с}^2\text{]}$

$a_M = 10{,}64 \text{ [см/с}^2\text{]}$

④ $a^\tau = 2{,}93 \text{ [см/с}^2\text{]}$

$a^n = 7{,}69 \text{ [см/с}^2\text{]}$

⑤ $\rho = 7 \text{ [см]}$

a^τ, a^n – на граф.

06.11.09