

$$\textcircled{1} \quad \begin{aligned} x(t) &= 10 - 3t + 5t^3 \\ y(t) &= 4t - 2t^2 + 9t^4 \\ z(t) &= 10 \end{aligned}$$

$$V_x(t) = x'(t) = -3 + 15t^2$$

$$V_y(t) = y'(t) = 4 - 4t + 36t^3$$

$$V_z(t) = z'(t) = 0$$

$$V(t) = \sqrt{V_x^2 + V_y^2 + V_z^2} = \sqrt{(-3 + 15t^2)^2 + (4 - 4t + 36t^3)^2 + 0^2} =$$

$$= \sqrt{1296t^6 - 63t^4 + 288t^3 - 74t^2 - 32t + 25}$$

$$a_x(t) = V_x'(t) = 30t$$

$$a_y(t) = V_y'(t) = -4 + 108t^2$$

$$a_z(t) = V_z'(t) = 0$$

$$a(t) = \sqrt{a_x^2 + a_y^2 + a_z^2} = \sqrt{(30t)^2 + (-4 + 108t^2)^2 + 0^2} =$$

$$= 2\sqrt{2916t^4 + 9t^2 + 4}$$

$$\begin{aligned} s(t) &= \sqrt{x(t)^2 + y(t)^2 + z(t)^2} = \sqrt{(10 - 3t + 5t^3)^2 + (4t^2 + 9t^4)^2 + 10^2} = \\ &= \sqrt{81t^8 + 94t^6 - 74t^4 + 100t^3 + 9t^2 - 60t + 200} \end{aligned}$$



② Dano:

$$t = 3 \text{ c}$$

$$V = ?$$

$$h = ?$$

$$V = u + at$$

$$0 = u + (9,8) \cdot 3$$

$$u = -9,8 \cdot 3 = -29,4 \text{ m/c}$$

$$h = ut + \frac{1}{2} at^2$$

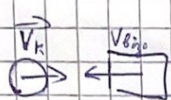
$$h = (-29,4) \cdot 3 + \frac{1}{2} \cdot 9,8 \cdot 3^2$$

$$h = -88,2 + 44,1 = -44,1 \text{ m}$$

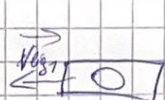
Rezultat: mas nagiba se 44,1 m, mas kinyas zimbuzino -29,4 m/c

③ Dano:

go:



nicke:



$$m_k = 3 \text{ kg}$$

$$V_{g1} = 0,2 \text{ m/c}$$

$$V_{g2} = 0,05 \text{ m/c}$$

$$m_g = 30 \text{ kg}$$

$$V_{k0} = ?$$

$$m_g V_{g1} - m_k V_{k0} = (m_k + m_g) V_{g1}$$

$$V_{k0} = - \frac{(m_k + m_g) V_{g1} - m_g V_{g2}}{m_k}$$

$$V_{k0} = - \frac{(3 + 30) \cdot 0,05 - 30 \cdot 0,2}{3} = 1,45 \text{ m/c}$$

$$A = \Delta W = W_1 - W_0 = 0 - \frac{m_k V_{k0}^2}{2} = 0 - \frac{3 \cdot (1,45)^2}{2} = -3,15 \text{ Jm}$$

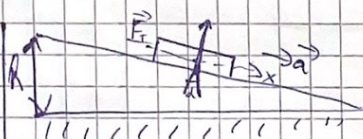
④ Dano:

$$h = 20 \text{ m}$$

$$\alpha = 30^\circ$$

$$\mu = 0,01$$

$$V_k = ?$$



$$\text{no } OX: mg \sin \alpha - \mu N = ma$$

$$\text{no } OY: mg \cos \alpha = N$$

$$mg (\sin \alpha - \cos \alpha \cdot \mu) = ma$$

$$a = g (\sin \alpha - \mu \cos \alpha)$$

Pyx pribkopruskoprenni, skoristayemoy poruzhnyozhnyy neperemennyy.

$$S = \frac{V_k^2 - V_0^2}{2a} = \frac{V_k^2}{2a}$$

$$S \cdot \sin \alpha = h \Rightarrow S = \frac{h}{\sin \alpha}$$

$$\left. \begin{aligned} \frac{h}{\sin \alpha} &= \frac{V_k^2}{2a} \\ V_k^2 &= \frac{2ah}{\sin \alpha} \end{aligned} \right\}$$

$$V_k^2 = \frac{2 \cdot g (\sin \alpha - \mu \cos \alpha) h}{\sin \alpha} = \frac{2 \cdot 9,8 (\sin 30^\circ - 0,01 \cdot \cos 30^\circ)}{\sin 30^\circ} = 19,26 \text{ m/c}$$

③ Дано:

$$V_2 = 2 \text{ м/с}$$

$$h = 50 \text{ м}$$

$$V_{\text{из}} = 8 \text{ м/с}$$

$$m = 10 \text{ кг}$$

$$V_{\text{из}} = 0 \text{ м/с}$$

$$A_{\text{из}} = ?$$

$$E_{\text{из}} = A_{\text{из}} + E_{\text{к2}}$$

$$A_{\text{из}} = E_{\text{к1}} - E_{\text{к2}}$$

$$A_{\text{из}} = mgh - \frac{mV_{\text{из}}^2}{2} =$$

$$= 4900 - 320 = 4580 \text{ Дж}$$

$$E_{\text{к2}} = 0 \quad E_{\text{к1}} = 0$$

до вершины высшее напряжение



6) Dato:

$$m = 2 \text{ kg}$$

$$V = 5 \text{ m/s}$$

$$W_K = ?$$

$$W_K = W_{\text{kinetic}} + W_{\text{rotational}}$$

$$W_{\text{kinetic}} = \frac{m V^2}{2}$$

$$W_{\text{rotational}} = \frac{J \omega^2}{2}$$

$$J = \frac{m R^2}{2}$$

$$\omega = \frac{V}{R}$$

$$W_K = \frac{m V^2}{2} + \frac{J \omega^2}{2} = \frac{m V^2}{2} + \frac{m R^2 V^2}{2 \cdot 2 R^2} = \frac{3}{4} m V^2 = \frac{3}{4} \cdot 2 \cdot 5^2 = 50 \text{ Joule}$$

⑦ Дано:

$$A = 50 \text{ mm}$$

$$n = 120$$

$$t_r = 1,5 \text{ c}$$

$$f_0 = 2 \times 60 = 120 \text{ c}$$

$$x(t) = A \cos(\omega t + \varphi)$$

$$T = \frac{2\pi d}{120} = 1 \text{ c}$$

$$\omega = \frac{2\pi}{T} = 2\pi \text{ рад/с}$$

$$\varphi = 0$$

$$x(t) = 50 \cos 2\pi t$$

$$x(1,5) = 50 \cos(2\pi \cdot 1,5)$$

Менюшка буде у положенні рівноваги через 1,5с після початку руху