

ZAKONI OČUVANJA

1. Ilić skripta 93. str.

Očuvanje kutne brzine gibanja sustava čestice: ako je zbroj momenata vanjskih sila koji djeluju na čestice jednak 0, onda je kutna količina gib. sustava čestica očuvana veličina.

→ Nažan uvjet za očuvanje kutne količine gibanja sustava čestica je: zbroj momenata svih vanjskih sila na sve čestice sustava jednak je nuli.

2. $\vec{F} = (5N)\hat{i} + (2y^2 \text{ Nm}^{-2})\hat{j}$. $W = ?$

$r_1 = (1, 5)$ $r_2 = (6, 6)$ (metri)

$$dW = \vec{F} \cdot d\vec{r} \int_{r_1}^{r_2} =$$

$$\Rightarrow W = W_x + W_y$$

$$W_x = \int_{r_x}^{r_{2x}} F_x \cdot dr_x = 5x \Big|_1^6 = 30 - 5 = \underline{\underline{25 \text{ J}}}$$

$$\boxed{185,67 \text{ J}}$$

$$W_y = \int_{r_{1y}}^{r_{2y}} F_y \cdot dr_y = \frac{1}{3} \cdot 2 \cdot y^3 \Big|_5^6 = \frac{2}{3} \cdot 6^3 - \frac{2}{3} \cdot 5^3 = \underline{\underline{60,6667 \text{ J}}}$$

3. Asteroid

[u/s]!

$$r = 1000 \text{ m} = 1000 \text{ m}$$

$$\rho = 3 \text{ g/cm}^3 = \frac{3}{1000} \frac{\text{kg}}{\text{cm}^3} = 0,003 \frac{\text{kg}}{1000 \text{ cm}^3}$$

$$v = 27,8 \text{ km/s}$$

Savršeno ne-elastičan

$$\Delta v = ?$$

$$L |v_2 - v_3|$$

$$m_1 = 5,992168 \times 10^{24}$$

u_1



$$p_1 = m_1 v_1$$

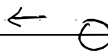
$$v_1 = 0$$

$$p_1 = 0$$

$$E_k = 0$$



u_2



$$p_2 = m_2 v_2$$

$$E_k = \frac{m v^2}{2}$$

$$p_3 = (m_1 + m_2) v_3$$

$$E_{k3} = \frac{(m_1 + m_2) v_3^2}{2}$$

→ količina gibanja je ista: $m_2 v_2 = (m_1 + m_2) v_3$

asteroid: $\frac{\text{kg}}{\text{m}^3}$

$$\rho = \frac{m}{V} \rightarrow m = \rho \cdot V \Rightarrow 3000 \cdot \frac{4}{3} \cdot \pi \cdot (500 \text{ m})^3$$

$$m_2 \cdot v_2 = (m_2 + m_1) v_3$$

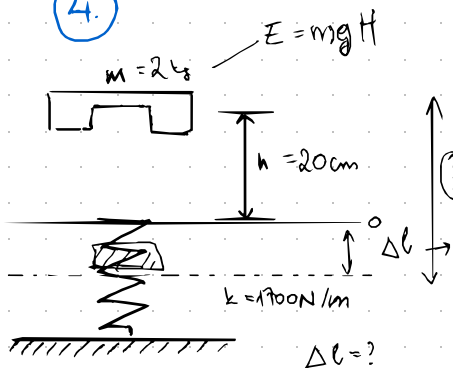
$$v_3 = \frac{m_2 \cdot v_2}{m_1 + m_2} = \frac{1,571 \times 10^{12} \times 27800}{1,571 \times 10^{12} + 5,992168 \times 10^{24}}$$

upisati u model

$$v_3 = 7,31289 \times 10^{-9}$$

$$\rightarrow 7,31289 \text{ e}^{-9}$$

4.



početna $E_p = E_{gp} = mgh$ E_k raste

konačna: $E_k = 0$ jer tijelo miruje (ne bježi gore)

$(H) = h + \Delta l \rightarrow$ potencijalno je $E_{gp} + E_x$

$\Rightarrow E_{kon} = mgh + \frac{k\Delta l^2}{2}$

budući da energija mora biti očuvana

$E_{poč} = E_{kon}$

Δl tražimo

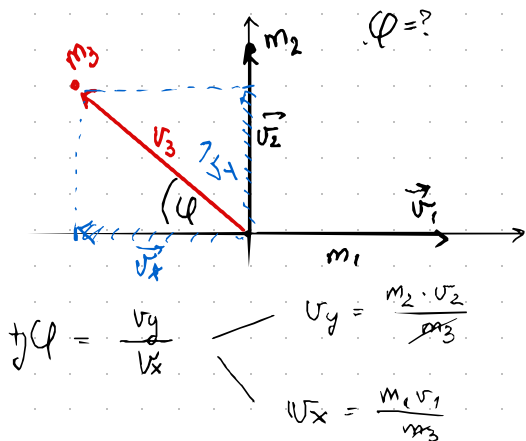
$mgh = mgh + \frac{k\Delta l^2}{2}$

$\frac{1}{2}k\Delta l^2 + mgh - mgh = 0$

$\Delta l_1 = 0,08 \text{ m}$

$t_{1,2} = \frac{-mgh \pm \sqrt{(mgh)^2 + 4 \cdot \frac{1}{2}k \cdot mgh}}{k} =$

5.



$\frac{m_1}{m_2} = \frac{2}{3}$

$m_1 = \frac{2}{3} m_2$

$\frac{v_1}{v_2} = \frac{1}{3}$

$v_1 = \frac{1}{3} v_2$

momenti sile:

$m_3 \cdot v_y = m_2 \cdot v_2 \rightarrow y\text{-smjer}$

$m_3 \cdot v_x = m_1 \cdot v_1 \rightarrow x\text{-smjer}$

$\tan \phi = \frac{m_2 \cdot v_2}{m_1 \cdot v_1} = \frac{3}{2} \cdot \frac{3}{1} = \frac{9}{2} \rightarrow 77,47^\circ$