ZAKONI OČUVANJA

1.) Ilijić skripta 93. str.

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

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

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

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

$dw = F \cdot dr \Big/ \int_{r_1}^{r_2} = \qquad \Longrightarrow W = W_x + W_y$

$W_x = \int_{r_{1x}}^{r_{2x}} F_x \cdot dr_x = 5x \Big|_1^6 = 30 - 5 = \underline{\underline{25}}\,J$

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

$\boxed{85{,}67\,J}$

3. Asteroid

[m/s]!

$m_1 = 5{,}972168 \times 10^{24}$

m_1 m_2

$r = 1000\,m = 1000\,m$

$\rho = 3\,g/cm^3 = \dfrac{\frac{3}{\cancel{1000}}\,kg}{\frac{1}{1000000}\,m} = 0{,}003$

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

$P_1 = m_1 v_1$

$v_1 = 0$

$P_1 = 0$

$E_k = 0$

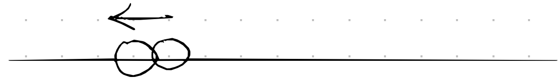
$P_2 = m_2 \cdot v_2$

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

Savršeno ne-elastičan

$\Delta v = ?$

$\rightarrow |v_2 - v_3|$



$P_3 = (m_1 + m_2) v_3$

$E_{k_3} = \dfrac{(m_1+m_2) v_3^2}{2}$

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

asteroid:

$\rho = \dfrac{m_2}{V} \rightarrow m = \rho \cdot V \Rightarrow 3000 \cdot \dfrac{4}{3} \cdot \pi \cdot (500\,m)^3$ (kg/m^3, m^3)

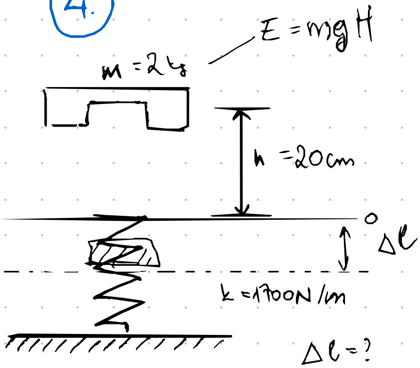
$m_2 \cdot v_2 = (m_2 + m_1) v_3$

$v_3 = \dfrac{m_2 \cdot v_2}{m_1 + m_2} = \dfrac{1{,}571 \times 10^{12} \times 27800}{1{,}571 \times 10^{12} + 5{,}972168 \times 10^{24}}$

upisati u moodel

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

4.



$\Delta l = ?$

početno $E_{pč} = E_{gp} = mgh$ $\quad$ E_k raste

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

$\hookrightarrow$ potencijalna je $E_{gp} + E_x$

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

budući da energija mora biti očuvana

$$E_{poč} = E_{kon.}$$

Δl tražimo

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

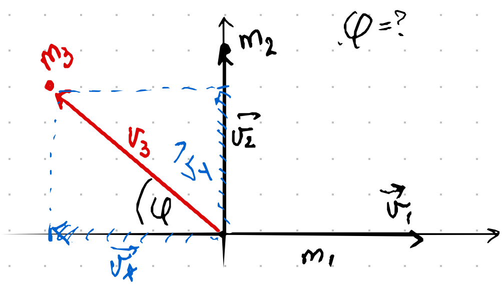
$$\Delta l_{1,2} = \frac{-(mg) \pm \sqrt{(mg)^2 + 4 \cdot \frac{1}{2} k \cdot (mgh)}}{k}$$

$$= \frac{-mg \pm mg \sqrt{1 + \frac{2kh}{mg}}}{k}$$

$$\Delta l_{1,2} = \frac{-mg}{k}\left(1 \pm \sqrt{1 + \frac{2kh}{mg}}\right) \sim \text{uvrstimo}$$

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

5.



$\varphi = ?$

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

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

momenti sile:

$m_3 \cdot v_y = m_2 \cdot v_2 \longrightarrow$ y-smjer

$m_3 \cdot v_x = m_1 \cdot v_1 \longrightarrow$ x-smjer

$tg\varphi = \frac{v_y}{v_x}$

$v_y = \frac{m_2 \cdot v_2}{\cancel{m_3}}$

$v_x = \frac{m_1 v_1}{m_3}$

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