Θέμα Β1 | 2025)

$$m_1 v_0 = (m_1 + m_2) V \Rightarrow$$

$$m v_0 = (m + 3m) V \Rightarrow$$

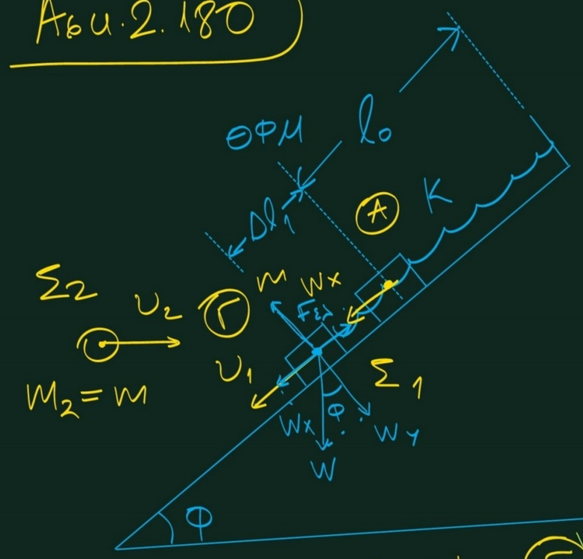
$$4mV = m v_0 \Rightarrow V = \frac{v_0}{4}$$

$$K_{αρχ} = \frac{1}{2} m_1 v_0^2 = \frac{1}{2} m v_0^2$$

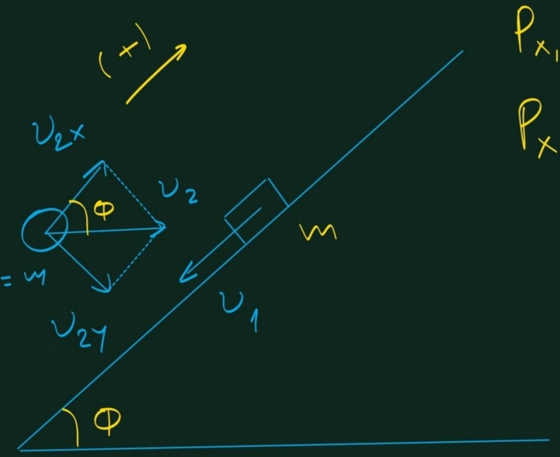
$$K_{τελ} = \frac{1}{2} (m_1 + m_2) V^2 = \frac{1}{2} \cdot 4m \cdot \frac{v_0^2}{16} = \frac{m v_0^2}{8}$$

$$\frac{K_{τελ}}{K_{αρχ}} = \frac{\frac{m v_0^2}{8}}{\frac{m v_0^2}{2}} = \frac{1}{4}$$

Ασκ. 2.180



α) Το κεκλιμένο επίπεδο είναι λείο, άρα η οργή διατηρείται στον άξονα x.



$P_{x,\pi\rho\iota\nu} = m_2 U_{2x} - m U_1$

$P_{x,\mu\epsilon\tau\acute{\alpha}} = (m_2 + m) V$

$m = 2\,kg$

$\varphi = 30^\circ$

$K = 100\,N/m$

Η θέση Γ εξ' ορισμού είναι θέση ισορροπίας

$W_x = F_{\epsilon\lambda} \Rightarrow mg\,\eta\mu\varphi = K \cdot \Delta l_1' \Rightarrow \Delta l_1' = \frac{2 \cdot 10 \cdot \frac{1}{2}}{100} = 0{,}1\,m$ στη ΘΙ

ΘΜΚΕ Α → Γ : $K_\Gamma - K_A = W_x \cdot \Delta l_1 + U_{\epsilon\lambda,A} - U_{\epsilon\lambda,\Gamma} \Rightarrow \frac{1}{2} m U_1^2 = mg\,\eta\mu\varphi \cdot \Delta l_1 + 0 - \frac{1}{2} K \cdot \Delta l_1^2 \Rightarrow$

$$\frac{1}{2}mv_1^2 = mg\,\eta\mu\varphi\cdot\Delta l_1 - \frac{1}{2}k\cdot\Delta l_1^2 \Rightarrow$$

$$\frac{1}{2}\cdot 2\cdot v_1^2 = 2\cdot 10\cdot\frac{1}{2}\cdot 0{,}2 - \frac{1}{2}\cdot 100\cdot 0{,}2^2 \Rightarrow$$

$$v_1^2 = 2 - \frac{1}{2}\cdot 0{,}04\cdot 100 = 0 \Rightarrow v_1 = 0$$

Άρα η θέση (Γ) είναι η κάτω ακραία θέση.

$$P_{x,\pi\rho\iota\nu} = P_{x,\upsilon\sigma\tau\acute{\alpha}} \Rightarrow m_2 v_{2x} - mv_1 = (m_2+m)V \Rightarrow$$

$$mv_2\cdot\sigma\upsilon\nu\varphi - m\cdot 0 = 2mV \Rightarrow$$

$$4\cdot\frac{\sqrt{3}}{2} = 2V \Rightarrow V = \sqrt{3}\ m/s.$$

προς τα πάνω

β) $K_{\pi\rho\iota\nu} = \frac{1}{2}m_2v_2^2 - \frac{1}{2}mv_1^2 =$

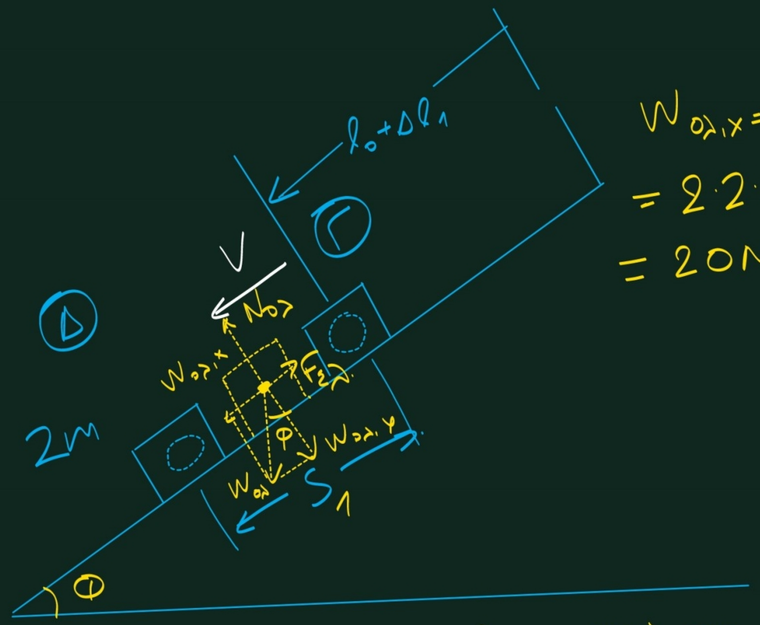
$= \frac{1}{2}\cdot 2\cdot 16 - \frac{1}{2}\cdot m\cdot 0 = 16\,J.$

$K_{\upsilon\sigma\tau\acute{\alpha}} = \frac{1}{2}(m_2+m)V^2 =$

$= \frac{1}{2}\cdot 2m\cdot\sqrt{3}^2 = 2\cdot 3 = 6\,J.$

Άρα: $|\Delta K| = 10\,Joule.$

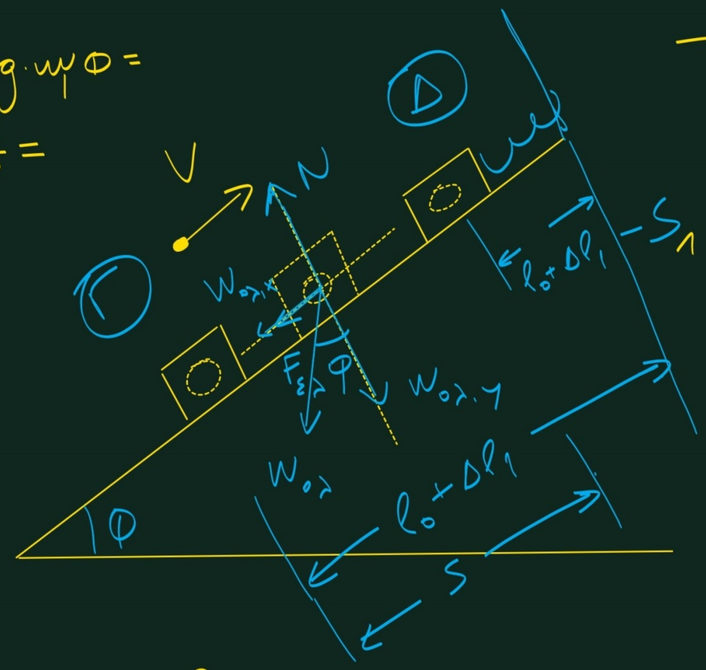
γ)



$W_{0\lambda,x} = 2mg \cdot \eta\mu\phi =$

$= 2 \cdot 2 \cdot 10 \cdot \frac{1}{2} =$

$= 20N$



$-6 = -50S_1^2 \Rightarrow$

$S_1^2 = \frac{12}{100} \Rightarrow$

$S_1 = \frac{2\sqrt{3}}{10} =$

$\frac{\sqrt{3}}{5}$ m

Το συσσωμάτωμα πάει κάτω το

Γ στο Δ:

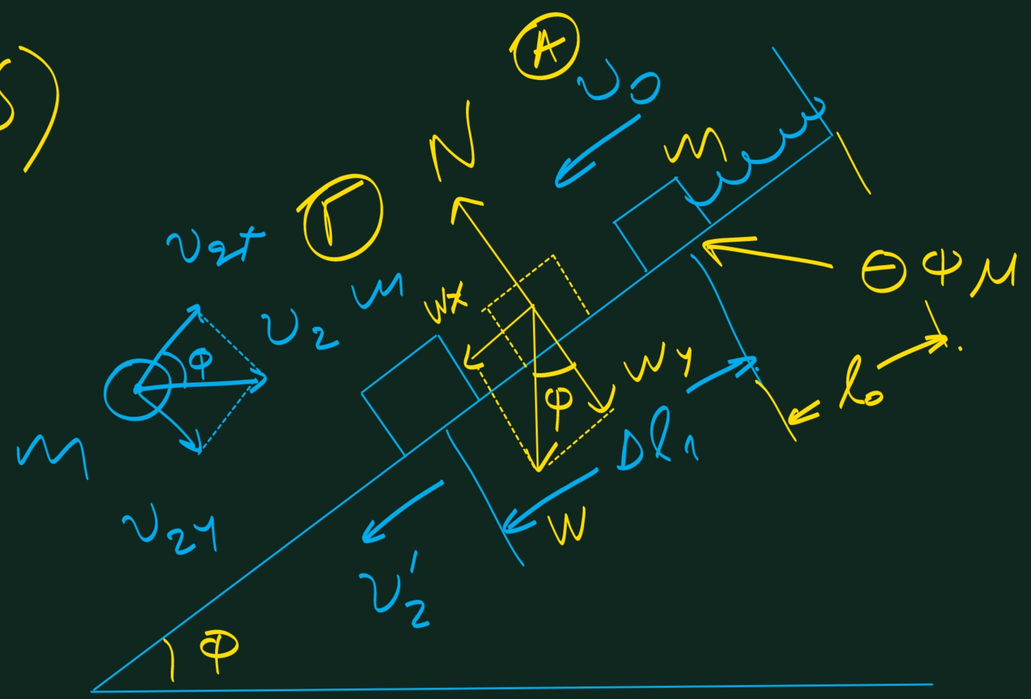
ΘΜΚΕ: Γ → Δ: $\Delta K = \Sigma W \Rightarrow 0 - \frac{1}{2} \cdot 2m \cdot V^2 = -W_{0\lambda,x} \cdot S_1 + U_{\epsilon\lambda,\Gamma} - U_{\epsilon\lambda,\Delta} \Rightarrow$

$-2 \cdot 3 = -20 \cdot S_1 + \frac{1}{2} K \cdot \Delta l_1^2 - \frac{1}{2} K (\Delta l_1 - S_1)^2 \Rightarrow$

$-6 = -20S_1 + \frac{1}{2} \cdot 100 \cdot 0,04 - \frac{1}{2} \cdot 100 (0,2 - S_1)^2 \Rightarrow -6 = -20S_1 + 2 - \frac{1}{2} 100 (0,04 - 0,4S_1 + S_1^2)$

$\Rightarrow -6 = -20S_1 + 2 - 2 + 20S_1 - 50S_1^2 \Rightarrow$

δ)



Για να έχουμε μέγιστη απώλεια ενέργειας, το συσσωμάτωμα πρέπει να ακινητοποιείται.

$$P_{x,\pi\rho\iota\nu} = P_{x,\mu\varepsilon\tau\acute{\alpha}} \Rightarrow$$

$$m\upsilon_{2x} - m\upsilon_2' = 0 \Rightarrow \upsilon_2' = \upsilon_{2x} = \upsilon_2 \sigma\upsilon\nu\varphi \Rightarrow$$

$$\upsilon_2' = 4 \cdot \frac{\sqrt{3}}{2} = 2\sqrt{3}\ m/s.$$

ΘΜΚΕ: A → Γ :

$$\frac{1}{2}m\upsilon_2'^2 - \frac{1}{2}m\upsilon_0^2 = mgw\varphi \cdot \Delta l_1 + 0 - \frac{1}{2}k\cdot\Delta l_1^2 \Rightarrow$$

$$\frac{1}{2}\cdot 2\cdot 4\cdot 3 - \frac{1}{2}2\upsilon_2^2 = 2\cdot 10\cdot\frac{1}{2}\cdot 0{,}2 - \frac{1}{2}100\cdot 0{,}2^2 \Rightarrow$$

$$24 - 2\upsilon_2^2 = 4 - 4 \Rightarrow 2\upsilon_2^2 = 24 \Rightarrow \upsilon_2^2 = 12 \Rightarrow \upsilon_2 = 2\sqrt{3}\ m/s.$$