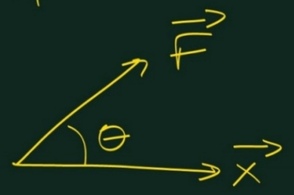
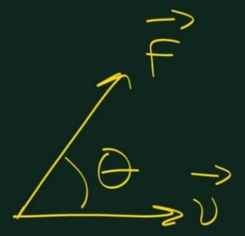
Έργο δύναμης

$$W_F = F \cdot x \cdot \sigma\upsilon\nu\theta$$

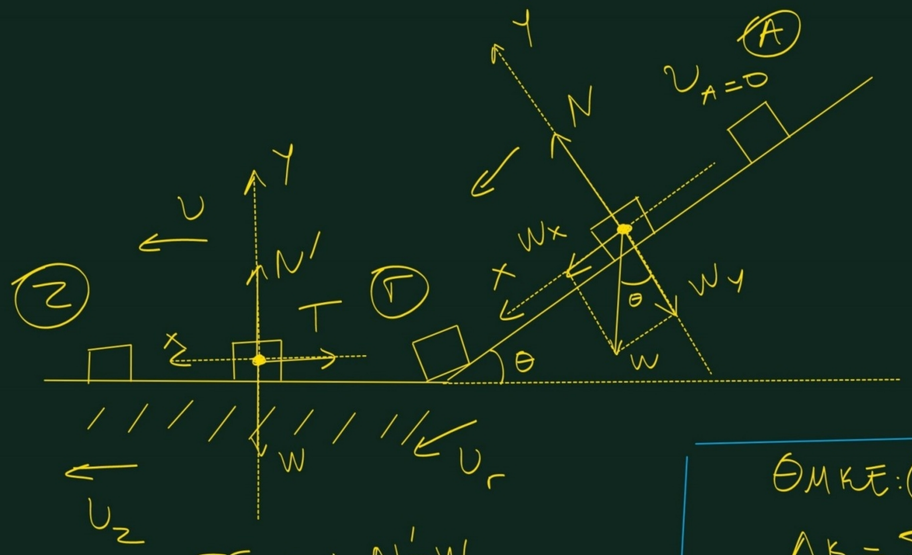


$$P_F = \frac{W_F}{t} = \frac{F \cdot x \cdot \sigma\upsilon\nu\theta}{t} = F \cdot \frac{x}{t} \cdot \sigma\upsilon\nu\theta =$$

$$P_F = F \cdot \upsilon \cdot \sigma\upsilon\nu\theta$$



Ασκ. 6 σελ. 193.)



$\Sigma F_y = 0 \Rightarrow N' = W$

$T = \mu N' = \mu W = \mu m g$

ΘΜΚΕ: Α → Γ:

$\Delta K = \Sigma W \Rightarrow$

$K_\Gamma - K_A = W_{W_x} + \cancel{W_{W_y}} + \cancel{W_N}^{0} \Rightarrow$

$(\vec{W}_y, \vec{N} \perp \Delta\vec{x})$

$K_\Gamma - 0 = W_x \cdot A\Gamma \Rightarrow$

$K_\Gamma = m \cdot g \cdot \eta\mu\theta \cdot A\Gamma$

ΘΜΚΕ: Γ → Ζ:

$\Delta K = \Sigma W \Rightarrow \quad K_2 - K_\Gamma = W_T + \cancel{W_{N'}}^{0} + \cancel{W_W}^{0} \Rightarrow$

$(\vec{N}', \vec{W} \perp \Delta\vec{x})$

$K_2 - mg \cdot A\Gamma \cdot \eta\mu\theta = -T \cdot \Gamma Z$

$$K_2 - m \cdot g \cdot \Delta r \cdot \eta\theta = -T \cdot r_2 \Rightarrow$$

$$\frac{1}{2} \cdot \cancel{m} \cdot v_2^2 - \cancel{m} \cdot g \cdot \Delta r \cdot \eta\theta = -\mu \cdot \cancel{m} \cdot g \cdot r_2 \Rightarrow$$

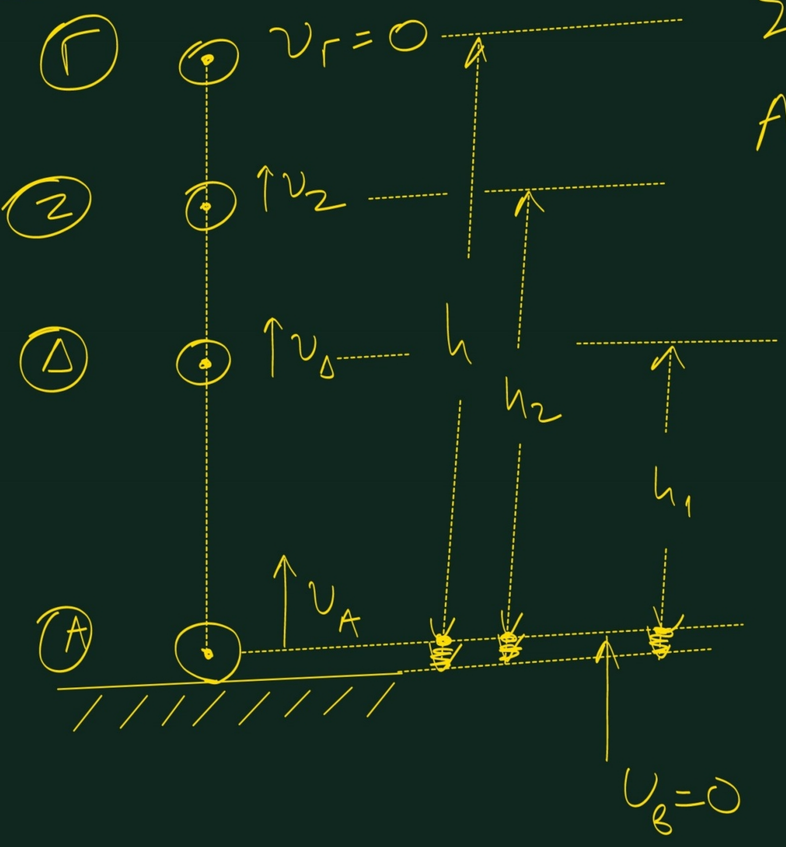
$$\frac{v_2^2}{2} - g \cdot \Delta r \cdot \eta\theta = -\mu \cdot g \cdot r_2 \Rightarrow$$

$$\frac{v_2^2}{2} - 10 \cdot 6 \cdot \eta 30^\circ = -0{,}2 \cdot 10 \cdot 6 \Rightarrow$$

$$\frac{v_2^2}{2} - 60 \cdot \frac{1}{2} = -12 \Rightarrow$$

$$\frac{v_2^2}{2} - 30 = -12 \Rightarrow \frac{v_2^2}{2} = 30 - 12 \Rightarrow \frac{v_2^2}{2} = 18 \Rightarrow v_2^2 = 36 \Rightarrow v_2 = 6\,m/s$$

Ασκ. 13 σελ. 104)



Στη θέση Δ έχουμε: $K_\Delta = \frac{K_A}{2}$

Στη θέση Ζ έχουμε: $P_Z = \frac{P_A}{2}$. $(P = m \cdot v = \text{ορμή})$

Α. ΑΔΜΕ: Α → Γ: $K_A + U_A = K_\Gamma + U_\Gamma \Rightarrow$

$K_A = m \cdot g \cdot h$.

ΑΔΜΕ: Α → Δ: $K_A + U_A = K_\Delta + U_\Delta \Rightarrow$

$K_A + 0 = \frac{K_A}{2} + m \cdot g \cdot h_1 \Rightarrow$

$m \cdot g \cdot h = \frac{m \cdot g \cdot h}{2} + m \cdot g \cdot h_1 \Rightarrow h = \frac{h}{2} + h_1 \Rightarrow$

$40 = 20 + h_1 \Rightarrow \boxed{h_1 = 20\,m}$

B. $p_2 = \frac{p_A}{2} \Rightarrow m \cdot v_2 = \frac{m \cdot v_A}{2} \Rightarrow v_2 = \frac{v_A}{2}$

$K_2 = \frac{1}{2} m \cdot v_2^2 = \frac{1}{2} \cdot m \cdot \left(\frac{v_A}{2}\right)^2 = \frac{1}{4} \cdot \frac{1}{2} \cdot m \cdot v_A^2 \Rightarrow$

$K_2 = \frac{1}{4} K_A$

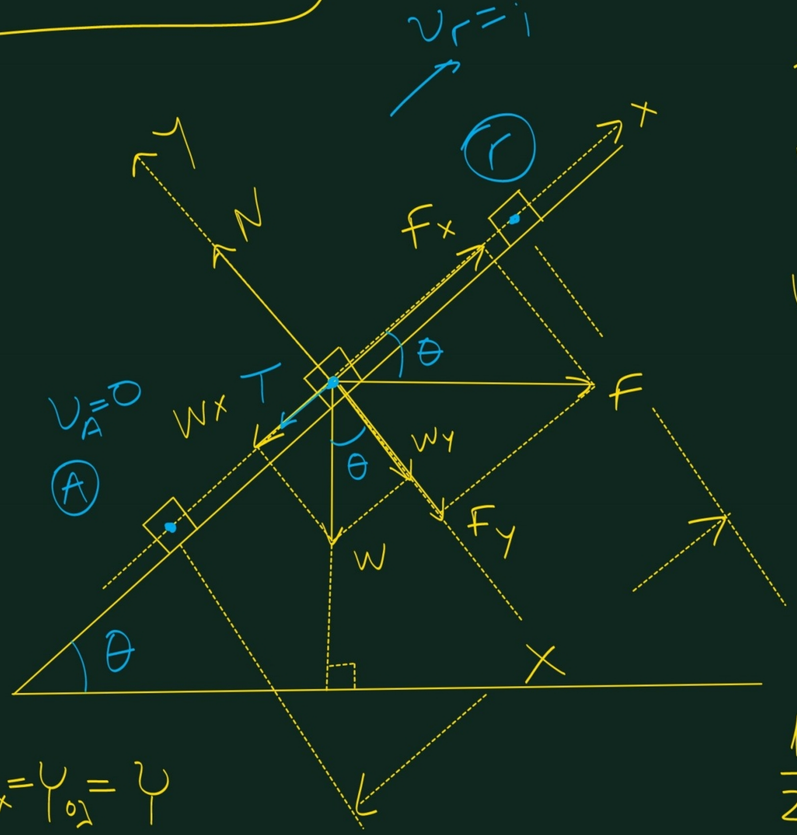
ADME: (A) → (2): $K_A + U_A = K_2 + U_2 \Rightarrow$ ($U_A = 0$)

$K_A + 0 = \frac{K_A}{4} + m \cdot g \cdot h_2 \Rightarrow$

$m \cdot g \cdot h = \frac{m \cdot g \cdot h}{4} + m \cdot g \cdot h_2 \Rightarrow$

$h = \frac{h}{4} + h_2 \Rightarrow 40 = \frac{40}{4} + h_2 \Rightarrow 40 = 10 + h_2 \Rightarrow \boxed{h_2 = 30\,m}$

Ασκ.16 σελ.194.



$F_x = F \cdot \sigma\upsilon\nu\theta = 100 \cdot 0{,}8 = 80N$

$F_y = F \cdot \eta\mu\theta = 100 \cdot 0{,}6 = 60N$

$W_x = m \cdot g \cdot \eta\mu\theta = 5 \cdot 10 \cdot 0{,}6 = 30N$

$W_y = m \cdot g \cdot \sigma\upsilon\nu\theta = 5 \cdot 10 \cdot 0{,}8 = 40N$

ΘΜΚΕ: Α → Γ: $\Delta K = \Sigma W \Rightarrow$

$K_\Gamma - \cancel{K_A^{0}} = W_{W_x} + \cancel{W_{W_y}^{0}} + W_{f_x} + \cancel{W_{f_y}^{0}} + \cancel{W_N^{0}} + W_T$

$(\vec{W}_y, \vec{f}_y, \vec{N} \perp \Delta\vec{x})$

$\frac{1}{2} m \cdot \upsilon_\Gamma^2 = -W_x \cdot X + f_x \cdot X - T \cdot X$

$\upsilon_{\sigma\tau,max} = \upsilon_{0,2} = \upsilon$

$$\Sigma F_y = 0 \Rightarrow N - W_y - F_y = 0 \Rightarrow$$

$$N = W_y + F_y \Rightarrow N = 60 + 40 \Rightarrow$$

$$N = 100N$$

$$\gamma = 0,4$$

$$T = \gamma \cdot N \Rightarrow T = 40N$$

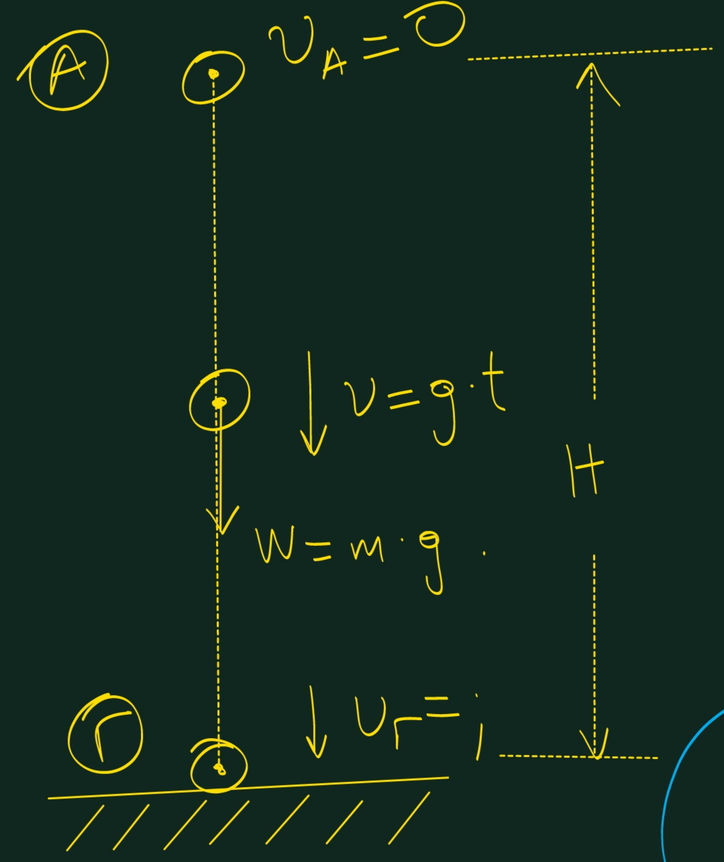
$$\frac{1}{2} m \cdot v_r^2 = -W_x \cdot x + F_x \cdot x - T \cdot x \Rightarrow$$

$$\frac{1}{2} \cdot 5 \cdot v_r^2 = -30 \cdot x + 80 \cdot x - 40 \cdot x \Rightarrow$$

$$\frac{1}{2} \cdot \cancel{5} \cdot v_r^2 = 10 \cdot \cancel{5} \Rightarrow \frac{v_r^2}{2} = 10 \Rightarrow v_r^2 = 20 \Rightarrow v_r = \sqrt{20} \Rightarrow$$

$$v_r = 2\sqrt{5}\ m/s.$$

Ασκ. 17 σελ. 194.



Α. ΘΜΚΕ: Α → Γ: $\Delta K = \Sigma W \Rightarrow$

$K_\Gamma - K_A = W_{W(A\to\Gamma)} \Rightarrow \frac{1}{2} m \cdot \upsilon_\Gamma^2 - 0 = W \cdot H \Rightarrow$

$\frac{1}{2} \cdot m \cdot \upsilon_\Gamma^2 = m \cdot g \cdot H \Rightarrow \upsilon_\Gamma^2 = 2gH \Rightarrow$

$\upsilon_\Gamma^2 = 2 \cdot 10 \cdot 20 \Rightarrow \upsilon_\Gamma^2 = 400 \Rightarrow \upsilon_\Gamma = 20\ m/s.$

Β. Γενικά: $W_{F(1\to 2)} = U_1 - U_2 = -(U_2 - U_1) = -\Delta U$

Άρα: $\Delta U = -W_F$ ή ισοδύναμα: $\Delta U = -\Delta W_F \Rightarrow$

$$\frac{\Delta U}{\Delta t} = -\frac{\Delta W_F}{\Delta t} = -P_F$$

ρυθμός μεταβολής δυναμικής ενέργειας

Εδώ: $F = W$ οπότε:

$$\frac{\Delta U}{\Delta t} = -\frac{\Delta W_W}{\Delta t} = -P_W$$

← Ισχύς βάρους.

$$\frac{\Delta U}{\Delta t} = -P_W = -W \cdot U \cdot \sigma\upsilon\nu 0^\circ \Rightarrow$$

$$\frac{\Delta U}{\Delta t} = -m \cdot g \cdot g \cdot t \cdot 1 \Rightarrow$$

$$\frac{\Delta U}{\Delta t} = -m \cdot g^2 t \Rightarrow$$

$$\frac{\Delta U}{\Delta t} = -1 \cdot 10^2 \cdot t = -100t$$

$$\boxed{\frac{\Delta U}{\Delta t} = -100t \ (W \propto H)}$$

Χρόνος πτώσης: $H = \frac{1}{2} \cdot g \cdot t_1^2 \Rightarrow 20 = \frac{1}{2} \cdot 10 \cdot t_1^2 \Rightarrow$

$$\frac{20}{5} = \frac{g t_1^2}{g} \Rightarrow t_1^2 = 4 \Rightarrow t_1 = 2 sec.$$

Για $t=0$: $\frac{\Delta U}{\Delta t} = 0 \ J/s \ (W \propto H)$

Για $t=2sec$: $\frac{\Delta U}{\Delta t} = -200 \ J/s.$