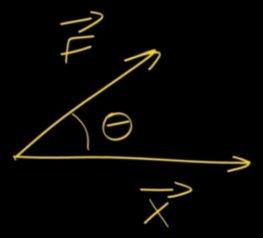
## Έργο δύναμης:

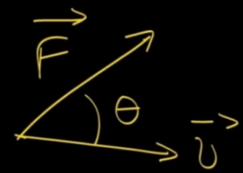
$$W_F = F \cdot x \cdot \sigma\upsilon\nu\theta$$



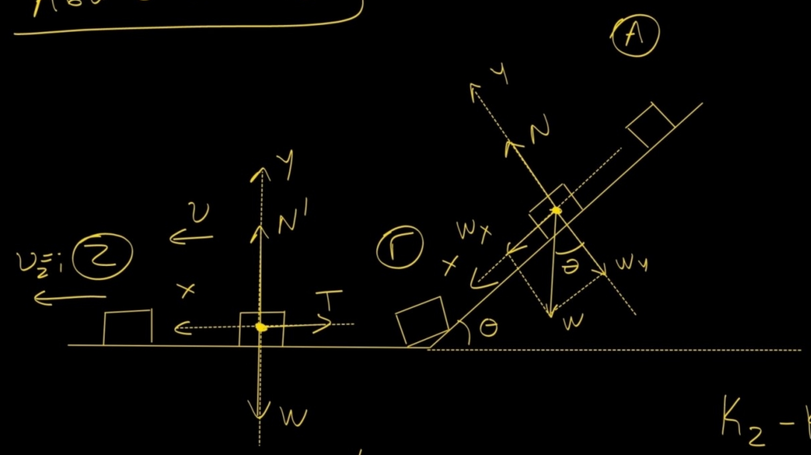

## Ισχύς δύναμης:

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

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



Ασκ. 6 σελ. 193.




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

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

ΘΜΚΕ: Α → Γ :

$\Delta K = \Sigma W \Rightarrow K_\Gamma - K_A = W_{w_x} + \cancel{W_{w_y}}^{\,0} + \cancel{W_N}^{\,0} \Rightarrow$

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

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

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

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

$K_Z - K_\Gamma = \cancel{W_{N'}}^{\,0} + \cancel{W_w}^{\,0} + W_T \Rightarrow$ $(\vec{N}', \vec{w} \perp \Delta\vec{x})$

$K_Z - m \cdot g \cdot \eta\mu\theta \cdot A\Gamma = W_T \Rightarrow$

$K_Z - m \cdot g \cdot A\Gamma \cdot \eta\mu\theta = -T \cdot \Gamma Z$

$$K_2 - m \cdot g \cdot A\Gamma \cdot \eta\mu\theta = -\gamma \cdot m \cdot g \cdot \Gamma Z \Rightarrow$$

$$\frac{1}{2} \cdot m \cdot v_2^2 - m \cdot g \cdot A\Gamma \cdot \eta\mu\theta = -\gamma \cdot m \cdot g \cdot \Gamma Z \Rightarrow$$

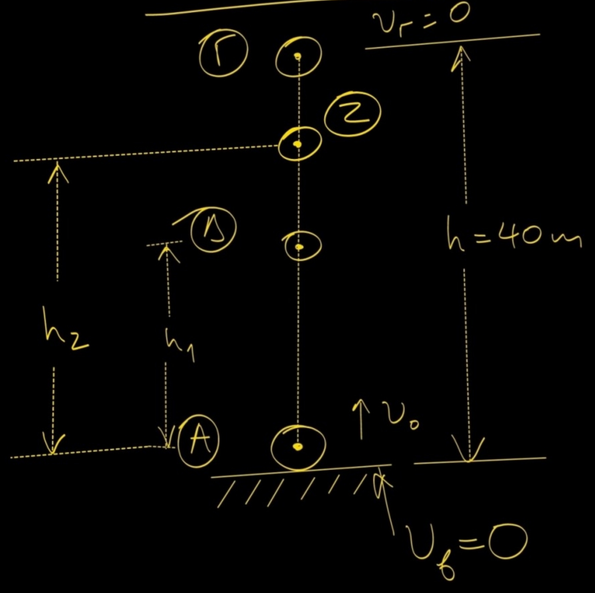
$$\frac{v_2^2}{2} - g \cdot A\Gamma \cdot \eta\mu\theta = -\gamma \cdot g \cdot \Gamma Z \Rightarrow$$

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

$$\frac{v_2^2}{2} - 30 = -12 \Rightarrow \frac{v_2^2}{2} = 30 - 12 \Rightarrow$$

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

Ασκ. 13 σελ. 194.)




α) $K_\Delta = \frac{K_A}{2}$ $\quad h_1 = ;$

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

$K_A = m \cdot g \cdot h$

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

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

$\frac{mgh}{2} = mgh_1 \Rightarrow$

$h_1 = \frac{h}{2} \Rightarrow$ **$h_1 = 20m$**

β) $P_2 = \frac{P_A}{2} \Rightarrow$

$m \cdot U_2 = \frac{m \cdot U_A}{2} \Rightarrow U_2 = \frac{U_A}{2}$

$K_2 = \frac{1}{2} m \cdot U_2^2 = \frac{1}{2} \cdot m \cdot \left(\frac{U_A}{2}\right)^2 \Rightarrow$

$K_2 = \frac{1}{4} \cdot \frac{1}{2} \cdot m \cdot U_A^2 \Rightarrow K_2 = \frac{1}{4} \cdot K_A$

ΑΔΜΕ: (Α) → (Σ) : $K_A + \cancel{U_A}^{\,0} = K_2 + U_2 \Rightarrow$

$mgh = \frac{1}{4} K_A + mg \cdot h_2 \Rightarrow$

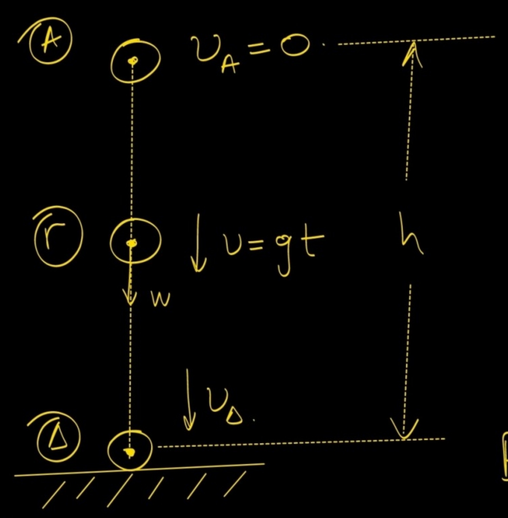
$\cancel{m} \cdot g \cdot h = \frac{1}{4} \cdot \cancel{m} \cdot g \cdot h + \cancel{m} \cdot g \cdot h_2 \Rightarrow$

$h = \frac{1}{4} h + h_2 \Rightarrow$

$40 = \frac{1}{4} \cdot 40 + h_2 \Rightarrow$

$40 = 10 + h_2 \Rightarrow h_2 = 30\,m$

Άσκ. 17 σελ. 194




Α. ΘΜΚΕ: Α → Δ:

$$\Delta K = \Sigma W \Rightarrow K_\Delta - K_A = W_W \Rightarrow$$

$$\frac{1}{2} \cdot m \cdot \upsilon_\Delta^2 - 0 = m \cdot g \cdot H \Rightarrow$$

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

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

Β. $H = \frac{1}{2} g \cdot t_{o\lambda}^2 \Rightarrow 20 = \frac{1}{2} \cdot 10 \cdot t_{o\lambda}^2 \Rightarrow t_{o\lambda}^2 = 4 \Rightarrow t_{o\lambda} = 2 \, sec.$

Η δυναμική ενέργεια μειώνεται.

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

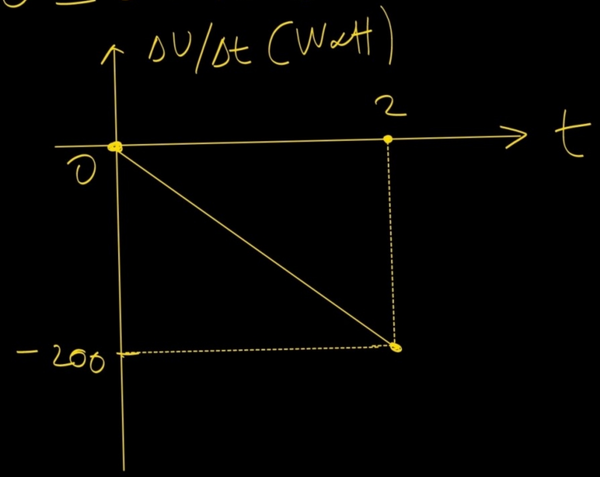
$0 \le t \le 2 sec$

$$\frac{\Delta U}{\Delta t} = -100t \; (SI)$$

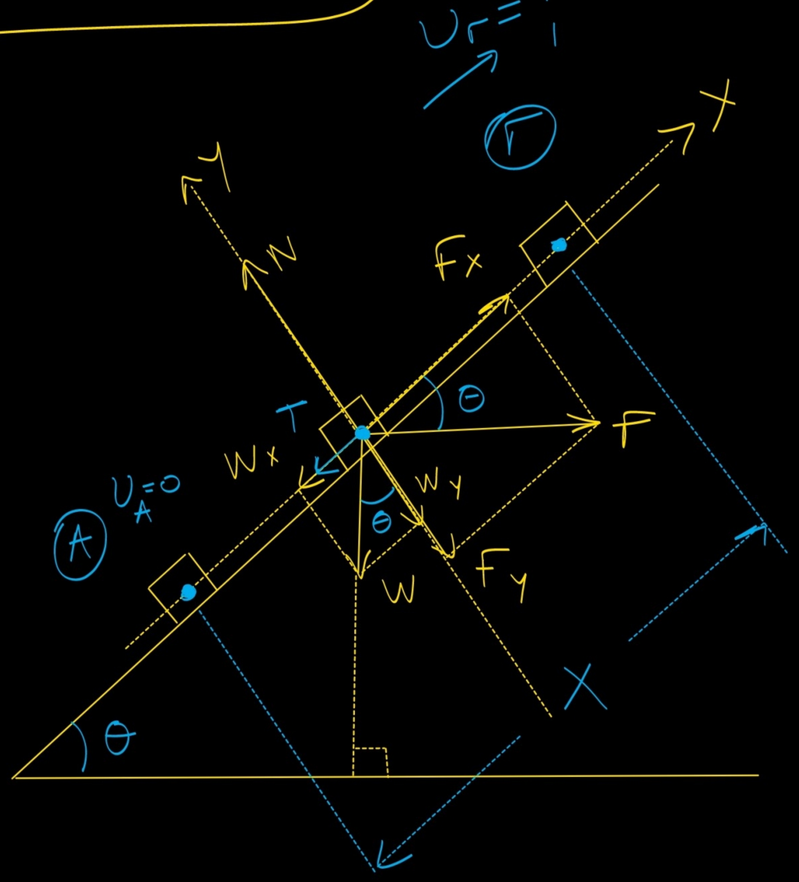
$$\frac{\Delta U}{\Delta t} = -100t \ (SI) \text{ in } (J/s)$$

$0 \le t \le 2 sec.$

1 Watt = 1 Joule/sec.



Ασκ. 16 σελ. 194.




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

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

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

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

$(\gamma_{\sigma\tau\alpha\tau.\,max} = \gamma_{o\lambda i\sigma\theta\eta\sigma\eta\varsigma} = \gamma = 0{,}4)$

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

$N - 40 - 60 = 0 \Rightarrow N = 100N$

$T = \gamma \cdot N = 0{,}4 \cdot 100 \Rightarrow \boxed{T = 40N}$

ΘΜΚΕ : (A) → (Γ) :

$\Delta K = \Sigma W \Rightarrow$

$K_\Gamma - \cancel{K_A}^{0} = W_{F_x} + \cancel{W_{F_y}}^{0} + W_{w_x} + \cancel{W_{w_y}}^{0} + W_T + \cancel{W_N}^{0}$

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

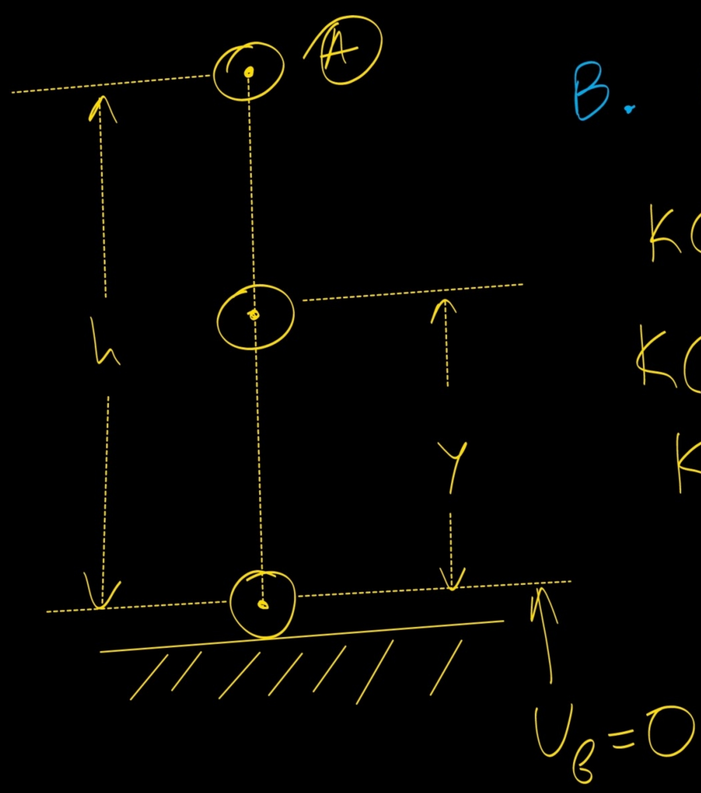
$\Rightarrow \frac{1}{2} \cdot m \cdot U_\Gamma^2 = F_x \cdot X - w_x \cdot X - T \cdot X \Rightarrow$

$\frac{1}{2} \cdot \cancel{8} \cdot U_\Gamma^2 = 80 \cdot \cancel{8} - 30 \cdot \cancel{8} - 40 \cdot \cancel{8} \Rightarrow$

$\frac{U_\Gamma^2}{2} = 10 \Rightarrow U_\Gamma^2 = 20 \Rightarrow U_\Gamma = \sqrt{20} = \sqrt{4 \cdot 5} \Rightarrow$

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

Αθλ. 2 σελ. 193.



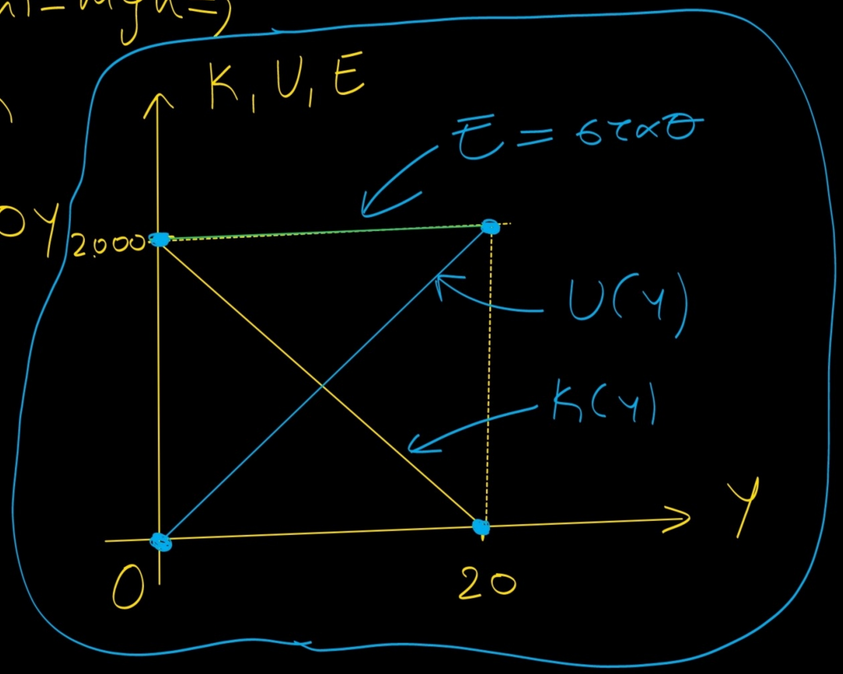

A. $U(h)=m\cdot g\cdot h=10\cdot 10\cdot 20=2.000$ Joule

B. $U(y)=m\cdot g\cdot y=100y \quad (0\le y\le 20m)$

$K(y)+U(y)=E=U(h)=mgh \Rightarrow$

$K(y)+100y=2000 \Rightarrow$

$K(y)=2000-100y$



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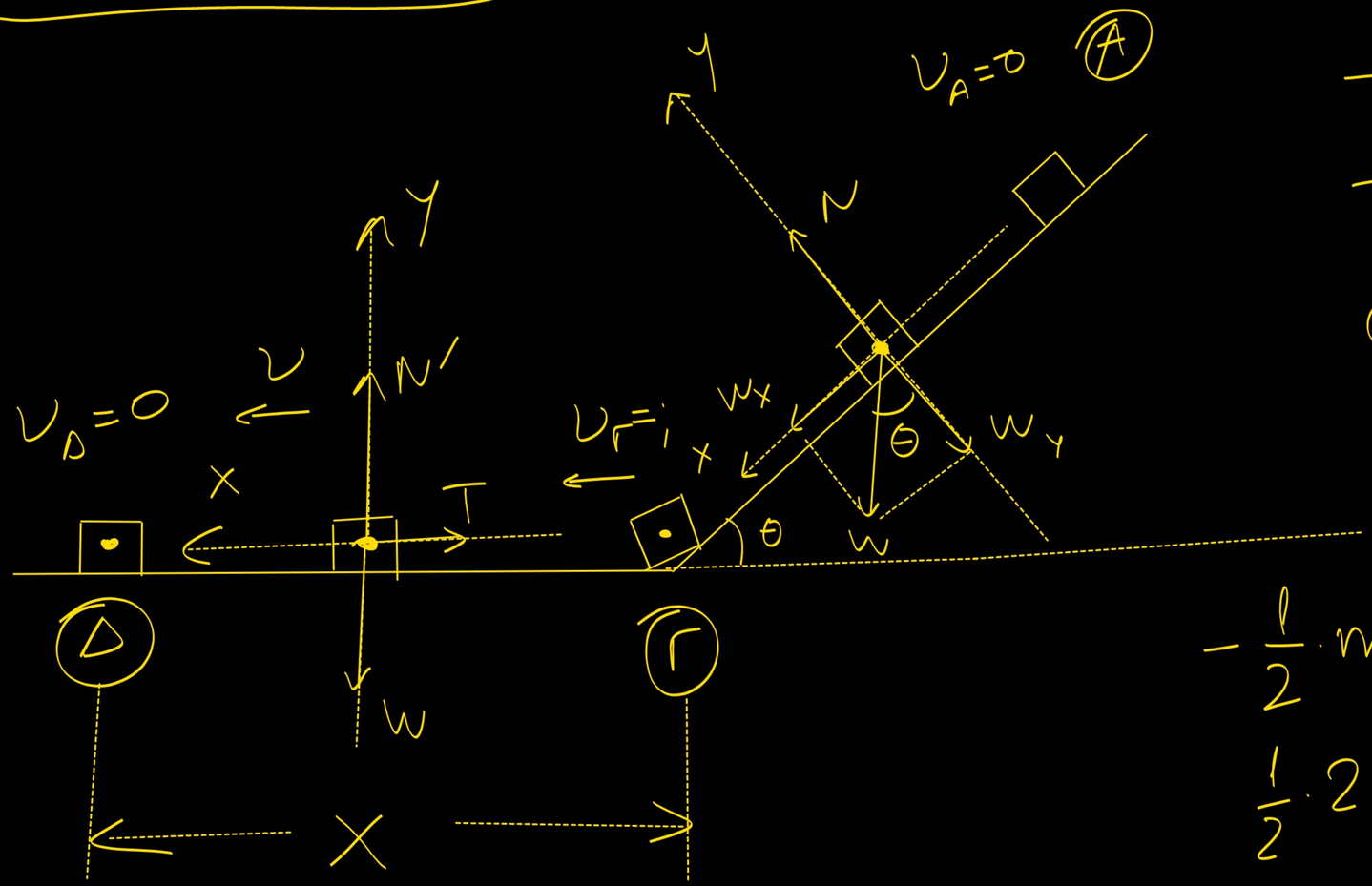



Α. Στο οριζόντιο επίπεδο:

$\Sigma F_y = 0 \Rightarrow N' = W = m \cdot g$.

$T = \mu \cdot N' = \mu \cdot m \cdot g \Rightarrow$

$T = 0,6 \cdot 2 \cdot 10 \Rightarrow T = 12\,N$.

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

$K_\Delta^{\,0} - K_\Gamma = W_T + W_{N'}^{\,0} + W_w^{\,0} \Rightarrow$

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

$-\frac{1}{2} \cdot m \cdot U_\Gamma^2 = -T \cdot x \Rightarrow$

$\frac{1}{2} \cdot 2 \cdot U_\Gamma^2 = 12 \cdot 5 \Rightarrow U_\Gamma^2 = 60 = 4 \cdot 15 \Rightarrow$

$U_\Gamma = 2\sqrt{15}\ m/s$

B. ΘΜΚΕ: Α → Γ.

$\Delta K = \Sigma W \Rightarrow$

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

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

$\frac{1}{2} m \cdot v_\Gamma^2 = W_{w_x} \Rightarrow$

$W_{w_x} = \frac{1}{2} \cdot 2 \cdot 60 \Rightarrow$

$W_{w_x} = 60 \text{ Joule} = W_x \cdot A\Gamma$

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

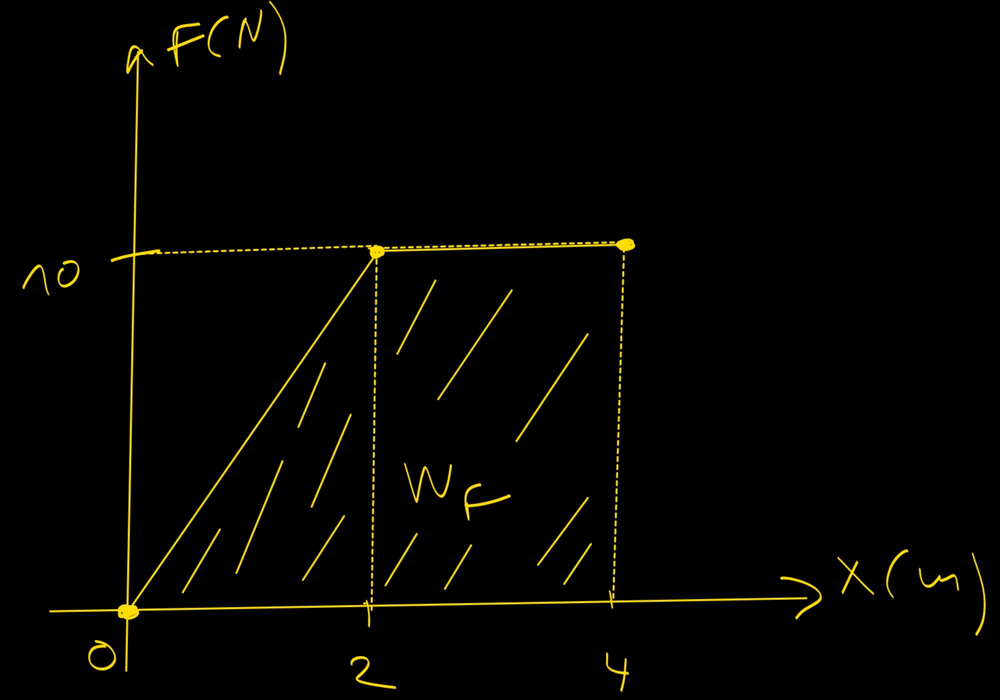
$K_A - K_\Delta = W_{min} + W_T + W'_{w_x} \Rightarrow$

$0 - 0 = W_{min} - T \cdot x - W_x \cdot A\Gamma \Rightarrow$

$0 = W_{min} - 12 \cdot 5 - 60 \Rightarrow$

$W_{min} = 120 \text{ Joule}.$

Α 6ω.18 6ε2.194.)




ΘΜΚΕ: $\Delta K = W_F \Rightarrow \frac{1}{2} \cdot m \cdot v^2 = W_F \Rightarrow$

$\frac{1}{2} \cdot 2 \cdot v^2 = \frac{2+4}{2} \cdot 10 \Rightarrow v^2 = 30 \Rightarrow v = \sqrt{30}\ m/s.$