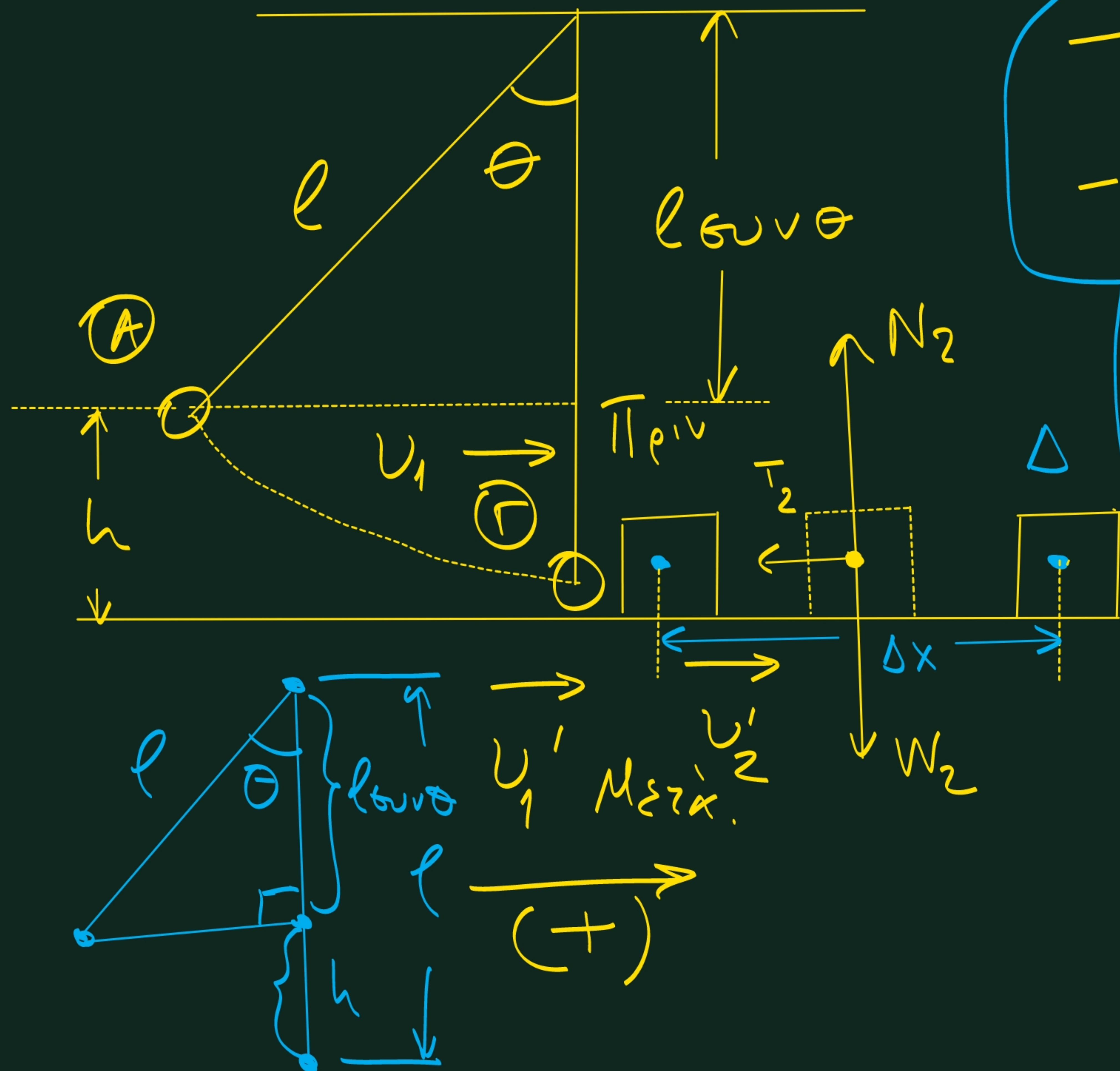


Αδμ. 1.117) (Σαββ)



a) $\Delta P_1 = m_1 v'_1 - m_1 v_1 \Rightarrow$

$$-12 = 2v'_1 - 2v_1 \Rightarrow$$

$$-6 = v'_1 - v_1$$

$$v'_1 = \frac{m_1 - m_2}{m_1 + m_2} v_1 =$$

$$v'_1 = \frac{2-3}{2+3} v_1 \Rightarrow$$

$$v'_1 = -\frac{v_1}{5}$$

$$T_2 = \gamma N_2 = \gamma m_2 g$$

$$-6 = v'_1 - v_1 \Rightarrow$$

$$-6 = -\frac{v_1}{5} - v_1 \Rightarrow$$

$$-6 = -\frac{6v_1}{5} \Rightarrow v_1 = 5 \text{ m/s.}$$

$$v'_2 = \frac{2m_1}{m_1 + m_2} v_1 = \frac{2 \cdot 2}{2+3} \cdot 5 \Rightarrow$$

$$v'_2 = 4 \text{ m/s.}$$

Παίρνουμε θετική για το m_2
γάρ την υπόθεση:

Θετική: $\Gamma \rightarrow \Delta$:

$$\Delta K = \Sigma W \Rightarrow 0 - \frac{1}{2} m_2 v'^2_2 = -T_2 \cdot \Delta x \Rightarrow$$

$$-\frac{1}{2} m_2 v'^2_2 = -\gamma m_2 g \Delta x \Rightarrow$$

$$\Delta x = \frac{v'^2_2}{2\gamma g} \Rightarrow \Delta x = \frac{16}{2 \cdot 0.1 \cdot 10} \Rightarrow$$

$$\Delta x = 8 \text{ m}$$

β) ΑΔΕ για το m_1 από το (Α) στο (Γ):

$$m_1 g h = \frac{1}{2} m_1 v_1^2 \Rightarrow$$

$$h = \frac{v_1^2}{2g} \Rightarrow h = \frac{5^2}{2 \cdot 10} = \frac{25}{20} = 1,25 \text{ m.}$$

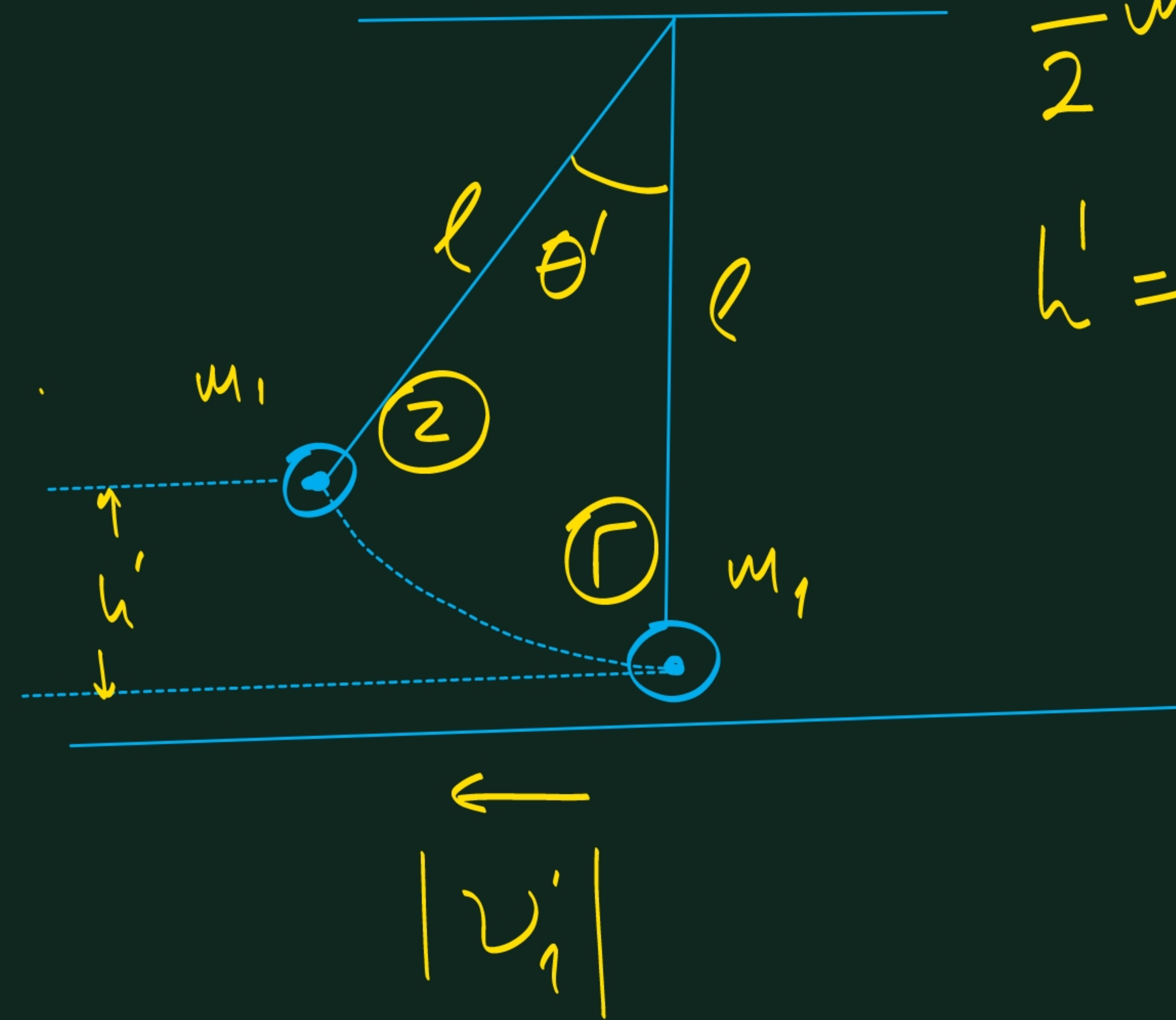
Από το σχήμα έχουμε: $h + \ell \cdot \sin \theta = \ell \Rightarrow$

$$1,25 + 2,5 \cdot \sin \theta = 2,5 \Rightarrow$$

$$2,5 \sin \theta = 1,25 \Rightarrow \sin \theta = \frac{1}{2} \Rightarrow$$

$$\theta = 60^\circ$$

$$\gamma) v_1' = -\frac{v_1}{5}$$



ΑΔΕ: (1) $\rightarrow$ (2)

$$\frac{1}{2} m_1 v_1'^2 = m_1 g h' \Rightarrow$$

$$h' = \frac{v_1'^2}{2g} = \frac{1}{20} \Rightarrow$$

$$h' = 0,05 \text{ m}$$

$$v_1' = -\frac{5}{5} = -1 \text{ m/s.}$$

δ) Ο ρυθμός μεταβολής της ορμής είναι η συνισταμένη δύναμη.

$$\Sigma \vec{F} = \Sigma \vec{F}_x + \Sigma \vec{F}_y$$

$$\Sigma F_y = N_2 - W_2 = 0$$

$$\text{Αρα: } \Sigma F = \Sigma F_x =$$

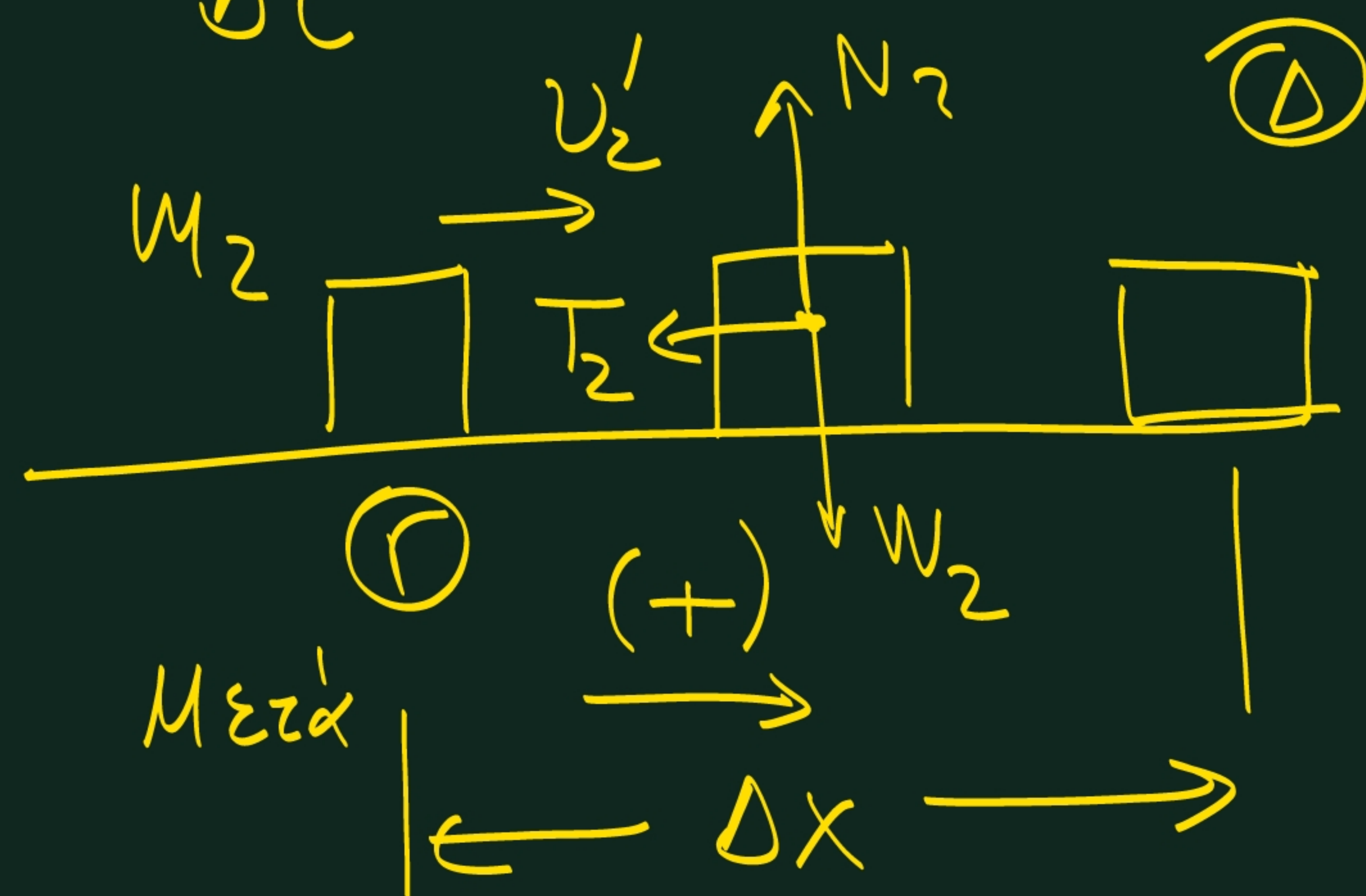
$$\Sigma F = -T_2 = -\mu N_2 = -\mu m_2 g$$

$$\frac{\Delta \vec{p}}{\Delta t} = \Sigma \vec{F} \text{ ή απλά:}$$

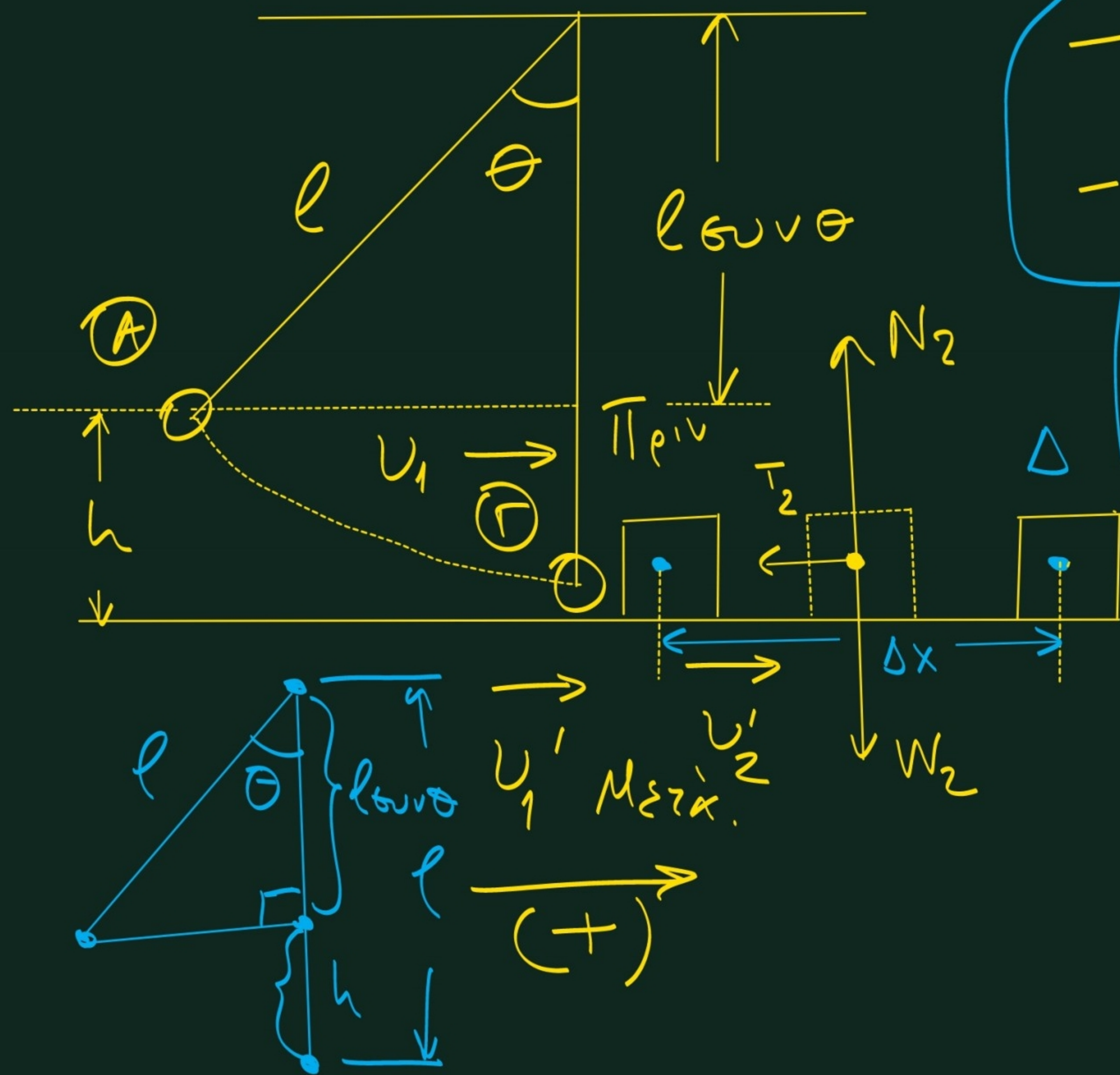
$$\frac{\Delta p}{\Delta t} = \Sigma F$$

$$\text{Συνεπώς: } \frac{\Delta p}{\Delta t} = -T_2 = -\mu m_2 g =$$

$$\frac{\Delta p}{\Delta t} = -0,1 \cdot 3 \cdot 10 \Rightarrow \frac{\Delta p}{\Delta t} = -3 \text{ kg} \cdot \text{m/s}^2$$



Αδυν. 1.117) ($\Sigma \propto BB$)



$$a) \Delta P_1 = m_1 v'_1 - m_1 v_1 \Rightarrow$$

$$-12 = 2v'_1 - 2v_1 \Rightarrow$$

$$-6 = v'_1 - v_1$$

$$v'_1 = \frac{m_1 - m_2}{m_1 + m_2} v_1 \Rightarrow$$

$$v'_1 = \frac{2-3}{2+3} v_1 \Rightarrow$$

$$v'_1 = -\frac{v_1}{5}$$

$$T_2 = \gamma N_2 = \gamma m_2 g$$

$$-6 = v'_1 - v_1 \Rightarrow$$

$$-6 = -\frac{v_1}{5} - v_1 \Rightarrow$$

$$-6 = -\frac{6v_1}{5} \Rightarrow v_1 = 5 \text{ m/s.}$$

$$v'_2 = \frac{2m_1}{m_1 + m_2} v_1 = \frac{2 \cdot 2}{2+3} \cdot 5 \Rightarrow$$

$$v'_2 = 4 \text{ m/s.}$$

Παίρνουμε ΘΜΚΕ για το m_2
γύρω την υπόθεση:

ΘΜΚΕ: $\Gamma \rightarrow \Delta$:

$$\Delta K = \Sigma W \Rightarrow 0 - \frac{1}{2} m_2 v'^2_2 = -T_2 \cdot \Delta x \Rightarrow$$

$$-\frac{1}{2} m_2 v'^2_2 = -\gamma m_2 g \Delta x \Rightarrow$$

$$\Delta x = \frac{v'^2_2}{2\gamma g} \Rightarrow \Delta x = \frac{16}{2 \cdot 0.1 \cdot 10} \Rightarrow \Delta x = 8 \text{ m}$$

β) ΑΔΕ για το m_1 από το $\textcircled{A}$ στο $\textcircled{F}$:

$$m_1 g h = \frac{1}{2} m_1 v_1^2 \Rightarrow$$

$$h = \frac{v_1^2}{2g} \Rightarrow h = \frac{5^2}{2 \cdot 10} = \frac{25}{20} = 1,25 \text{ m}$$

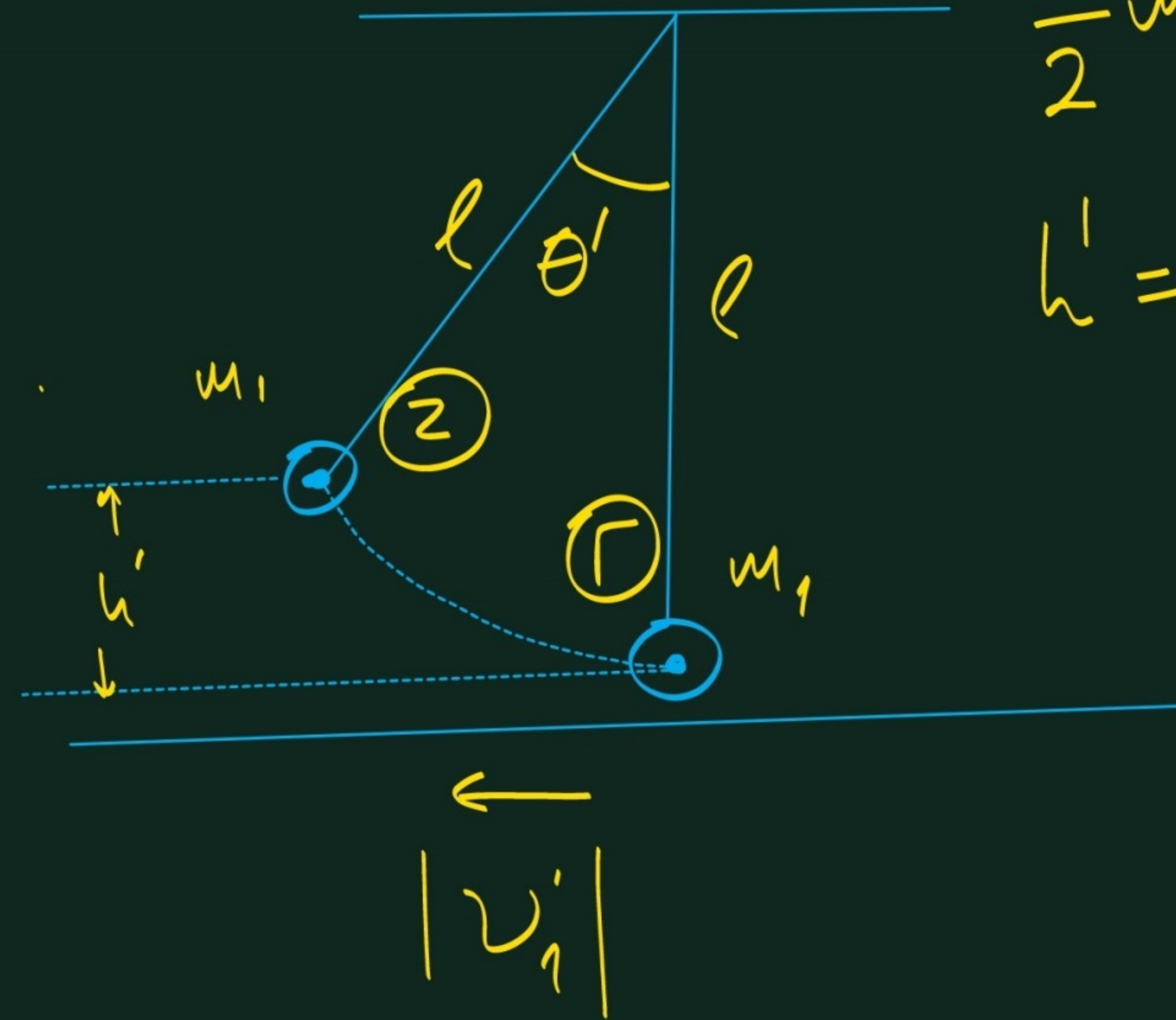
Από το σχήμα έχουμε: $h + \ell \cdot \sin \theta = \ell \Rightarrow$

$$1,25 + 2,5 \cdot \sin \Theta = 2,5 \Rightarrow$$

$$2,5 \sin \theta = 1,25 \Rightarrow \sin \theta = \frac{1}{2} \Rightarrow$$

$$\theta = 60^\circ$$

$$d) \quad v_1' = -\frac{v_1}{5}$$



$$v_1' = -\frac{\Sigma}{\Sigma} = -1 \text{ m/s.}$$

AΔE: (1) → (2)

$$\frac{1}{2} m_1 v_1'^2 = m_2 g h' \Rightarrow$$

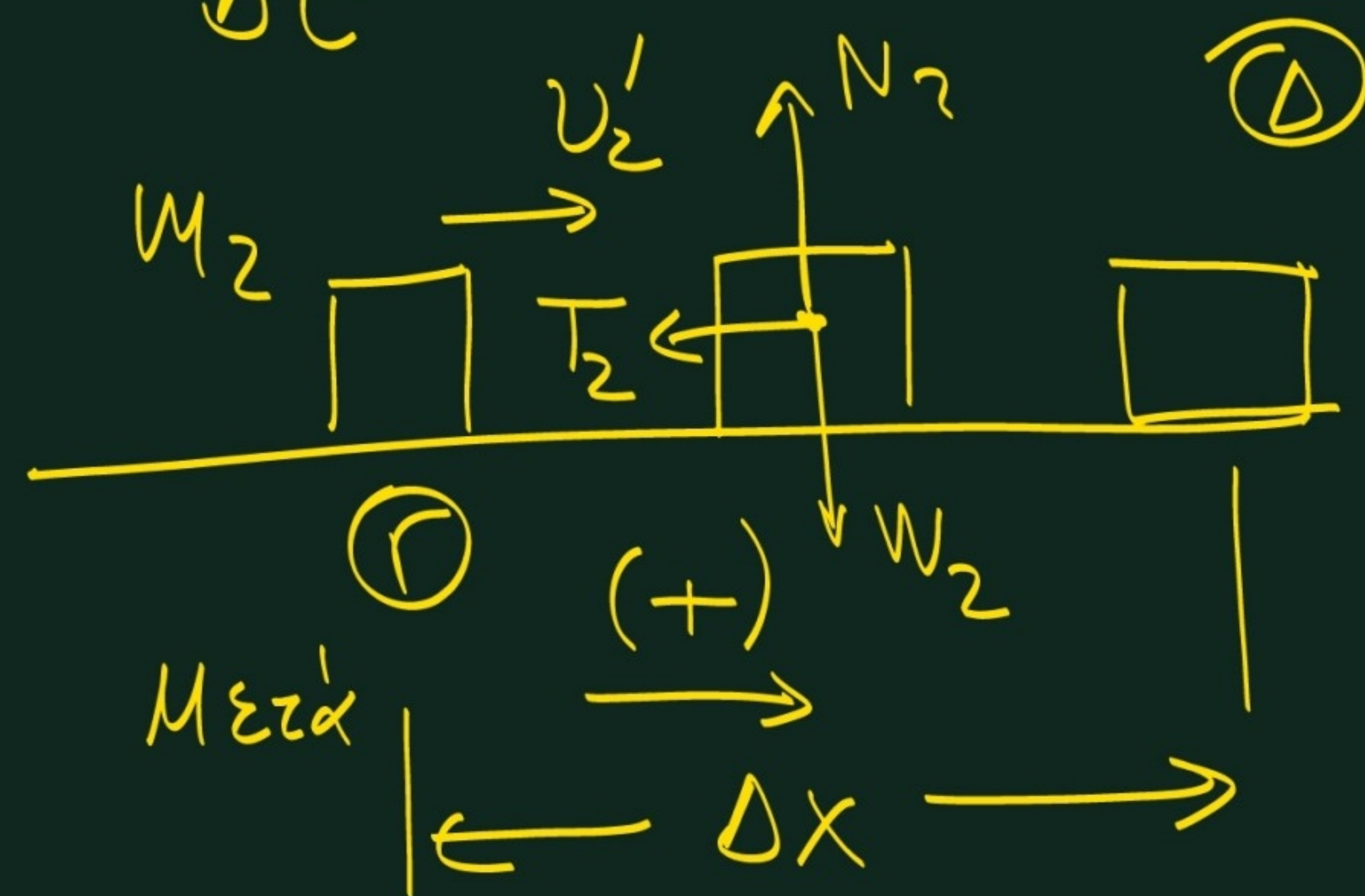
$$h' = \frac{v_1'^2}{2g} = \frac{1}{20} \Rightarrow$$

$$h' = 0,05 \text{ m}$$

δ) Ο ρυθμός μεταβολής της ορμής είναι η συνισταμένη δύναμη.

$$\frac{\Delta \vec{p}}{\Delta t} = \sum \vec{F} \quad \text{ή} \quad \alpha \eta \lambda \alpha :$$

$$\frac{\Delta p}{\Delta t} = \sum F$$



$$\sum \vec{F} = \sum \vec{F}_x + \sum \vec{F}_y$$

$$\sum F_y = N_2 - W_2 = 0$$

$$\text{Αρα: } \sum F = \sum F_x \Rightarrow$$

$$\sum F = -T_2 = -\mu N_2 = -\mu m_2 g$$

$$\text{Συνεπώς: } \frac{\Delta p}{\Delta t} = -T_2 = -\mu m_2 g =$$

$$\frac{\Delta p}{\Delta t} = -0,1 \cdot 3 \cdot 10 \Rightarrow \frac{\Delta p}{\Delta t} = -3 \text{ kg} \cdot \text{m/s}^2$$

Πυθαγόρας για το νόμο της κινητικής ενέργειας.

$$K = \frac{1}{2}mv^2$$

$$K(t) = \frac{1}{2}m(v(t))^2$$

Ο απλός τρόπος εύρεσης του $\frac{\Delta K}{\Delta t}$ είναι:

$$\frac{\Delta K}{\Delta t} = \frac{\sum F \cdot \Delta x}{\Delta t} = \sum F \cdot \frac{\Delta x}{\Delta t} = \sum F \cdot v$$

$$\left(\text{ή } \frac{\Delta K}{\Delta t} = \sum \vec{F} \cdot \vec{v} \right)$$

$$\text{Ανάλυση } \frac{\Delta K}{\Delta t} = \pm \sum F \cdot v$$

ανάλυση
για τα πρόσημα.

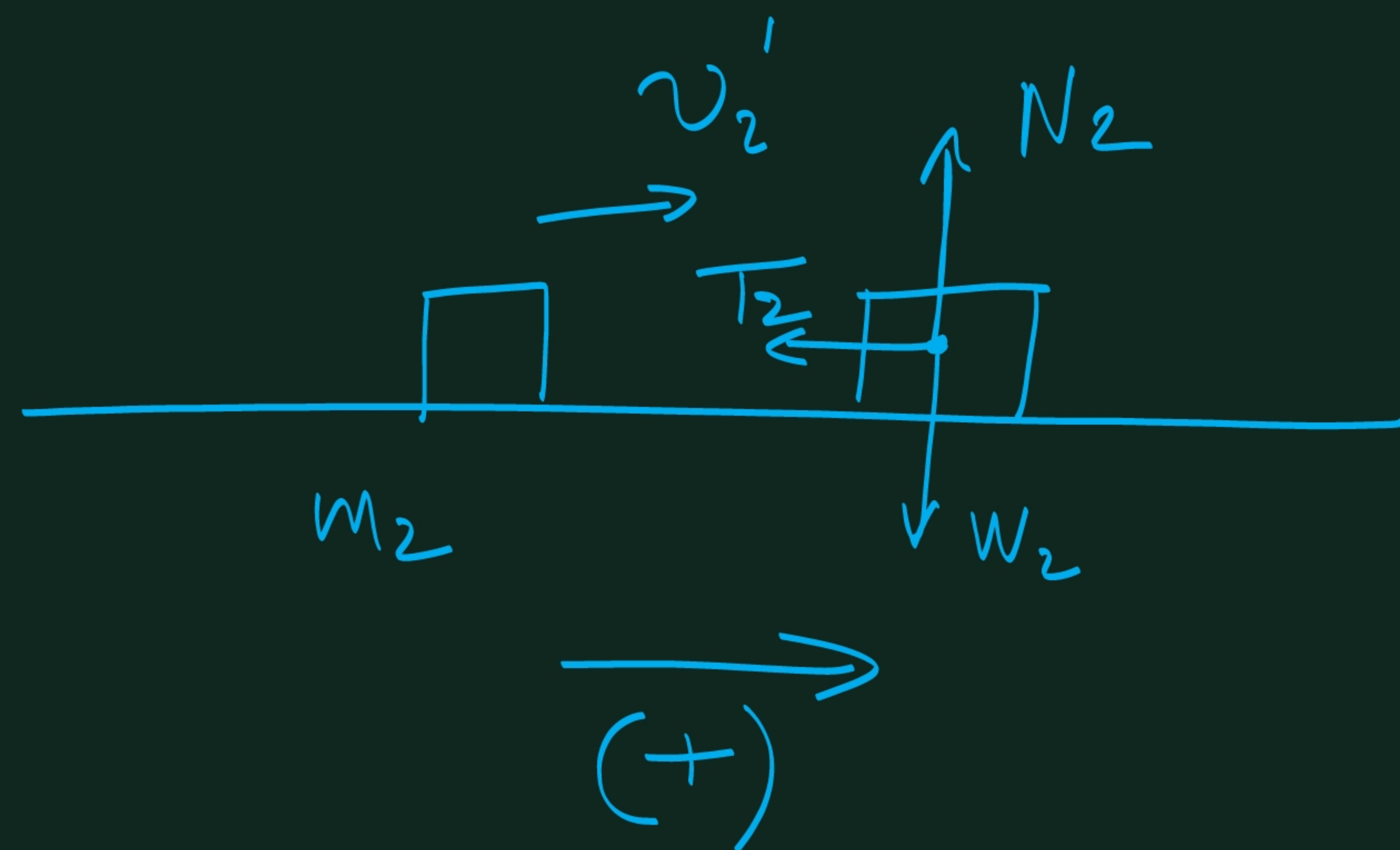
$$K = \frac{1}{2}mv^2 \Rightarrow$$

$$\frac{dK}{dt} = \frac{1}{2}m \frac{d}{dt}(v^2) \Rightarrow$$

$$\frac{dK}{dt} = \frac{1}{2} \cdot m \cdot 2v \cdot \frac{dv}{dt} \Rightarrow$$

$$\frac{dK}{dt} = mv \frac{dv}{dt} \Rightarrow$$

$$\frac{dK}{dt} = ma v = \sum F \cdot v$$



$$T_2 = \mu N_2 = \mu m_2 g = 0,1 \cdot 3 \cdot 10 = 3 \text{ N}$$

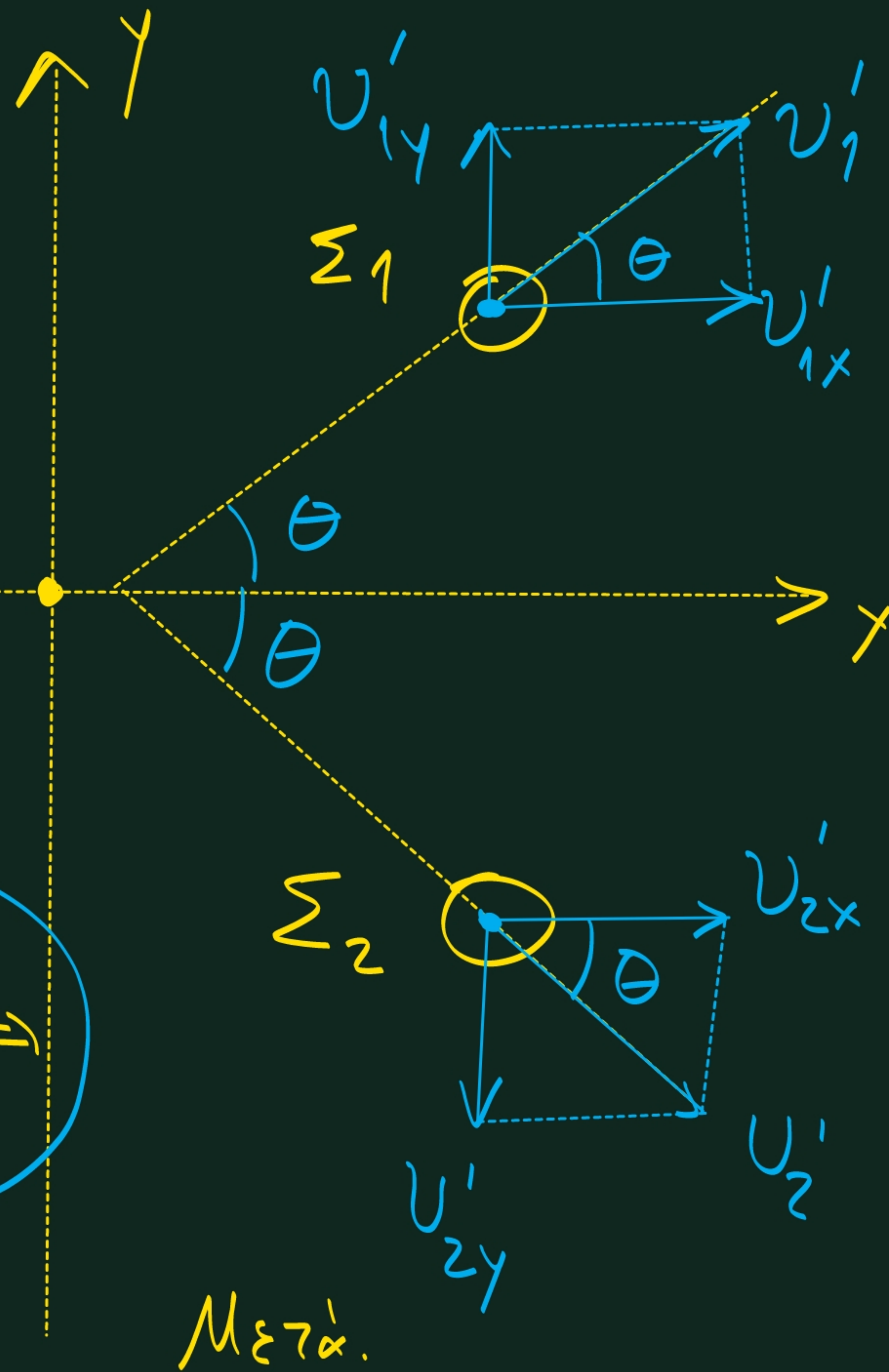
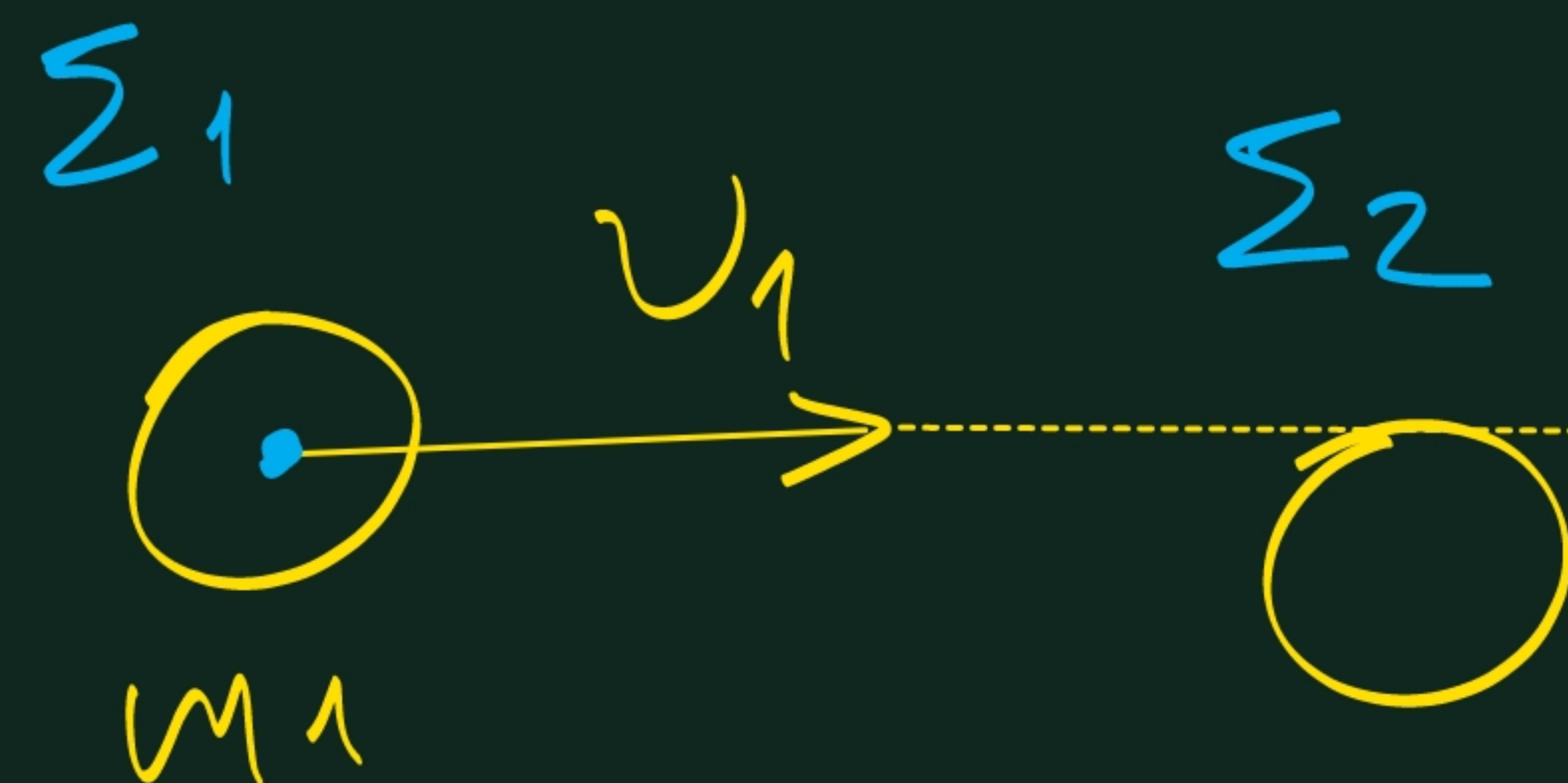
$$v_2' = 4 \text{ m/s}$$

$$\Sigma \vec{F} = \Sigma \vec{F}_x + \cancel{\Sigma \vec{F}_y} = \Sigma \vec{F}_x$$

$$\Sigma F = -T_2$$

$$\text{Ap\alpha: } \frac{\Delta K}{\Delta t} = \Sigma F \cdot v = -T_2 \cdot v_2' \Rightarrow \frac{\Delta K}{\Delta t} = -3 \cdot 4 \Rightarrow \frac{\Delta K}{\Delta t} = -12 \text{ J/sec}$$

Ασκ. 2.87 (Μαθ.)



Αρχ: $v_1 = (v'_1 + v'_2) \frac{\sqrt{3}}{2} = v'_1 \sqrt{3} \Rightarrow$
 $v'_1 = \frac{v_1}{\sqrt{3}}$
 και $v'_2 = \frac{v_1}{3\sqrt{3}}$

$m_2 = 3m_1.$

$p_{x, \text{πριν}} = p_{x, \text{μετά}} \Rightarrow$

$m_1 v_1 = m_1 v'_1 \cos \theta + m_2 v'_2 \cos \theta \Rightarrow$

$m_1 v_1 = m_1 v'_1 \cos \theta + 3m_1 v'_2 \cos \theta \Rightarrow$

$v_1 = (v'_1 + 3v'_2) \cdot \cos 30^\circ \Rightarrow$

$v_1 = (v'_1 + 3v'_2) \cdot \frac{\sqrt{3}}{2}$

$p_{y, \text{πριν}} = p_{y, \text{μετά}} \Rightarrow$

$0 = m_1 v'_{1y} - m_2 v'_{2y} \Rightarrow$

$m_1 v'_1 \sin \theta = 3m_1 v'_2 \sin \theta \Rightarrow v'_1 = 3v'_2$

$$K = \frac{1}{2} m_1 v_1^2$$

$$K'_1 = \frac{1}{2} m_1 v_1'^2 = \frac{1}{2} m_1 \cdot \frac{v_1^2}{3} = \frac{1}{3} \cdot \frac{1}{2} m_1 v_1^2 = \frac{K}{3}$$

$$K'_2 = \frac{1}{2} m_2 v_2'^2 = \frac{1}{2} \cdot 3 m_1 \cdot \frac{v_1^2}{9 \cdot 3} = \frac{1}{9} \cdot \frac{1}{2} m_1 v_1^2 = \frac{K}{9}$$

$$v_1' = \frac{v_1}{\sqrt{3}}$$

$$|\Delta K| = K - K'_1 - K'_2 = K - \frac{K}{3} - \frac{K}{9} = K - \frac{4K}{9} \Rightarrow$$

$$v_2' = \frac{v_1}{3\sqrt{3}}$$

$$|\Delta K| = \frac{5K}{9} \quad \Sigma \omega \text{ è } \tau_0(\mathcal{E}).$$

