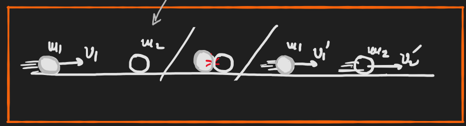
Τρ 10-11-2020

1ο ΓΕΛ ΣΑΛΑΜΙΝΑΣ

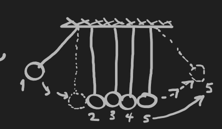
$v_2=0$



$\boxed{v_1' = \frac{m_1-m_2}{m_1+m_2}v_1}$ $\boxed{v_2' = \frac{2m_1}{m_1+m_2}v_1}$

I) $m_1=m_2=m$:

$\underbrace{v_1' = \frac{\cancel{m-m}}{m+m}v_1 = 0 \qquad v_2' = \frac{2m}{2m}v_1 = v_1}_{\text{ανταλλαγή ταχυτήτων}}$



$v_1'=0$ $v_2'=v_1$

v_2

II) $m_1 \gg m_2$:

m_1 v_1 m_2 $\Big\}$ m_1 v_1' m_2 v_2'

$m_1-m_2 \simeq m_1$ $(1000-1=999 \simeq 1000)$

$m_1+m_2 \simeq m_1$ $(1000+1=1001 \simeq 1000)$

$2m_1 = 2m_1$

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

$v_2' = \frac{2m_1}{m_1+m_2}v_1 \simeq \frac{2\cancel{m_1}}{\cancel{m_1}}v_1 = 2v_1$

III) $m_1 \ll m_2$:

m_1 v_1 m_2 $v_2=0$ $\Big\}$ v_1' m_1 m_2 $v_2' \simeq 0$

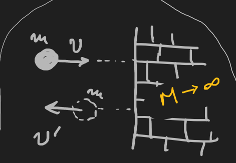
$m_1-m_2 \simeq -m_2$ $(1-1000=-999 \simeq -1000)$

$m_1+m_2 \simeq m_2$ $(1+1000 \simeq 1000)$

$2m_1 \simeq 0$ $(2\cdot 1 = 2 \ll 1000 \Rightarrow 2 \to 0$ σε σχέση με το 1000$)$

$v_1' = \frac{m_1-m_2}{m_1+m_2}v_1 \simeq \frac{-\cancel{m_2}}{\cancel{m_2}}v_1 = -v_1 \rightarrow v' = -v$

$v_2' = \frac{2m_1}{m_1+m_2}v_1 \simeq \frac{0}{m_2}v_1 = 0 \rightarrow v_{τοίχου} = 0$ πάντα



$$\boxed{\begin{aligned} v_1' &= \frac{m_1-m_2}{m_1+m_2}v_1 + \frac{2m_2}{m_2+m_1}v_2 \quad (1) \\ v_2' &= \frac{2m_1}{m_1+m_2}v_1 + \frac{m_2-m_1}{m_2+m_1}v_2 \quad (2) \end{aligned}}$$

I) $m_1=m_2$:

(1): $v_1' = \frac{\cancel{m-m}}{m+m}v_1 + \frac{2m}{m+m}v_2 = \frac{\cancel{2m}}{\cancel{2m}}v_2 = v_2$ $\Big\}$ $v_1' = v_2$

ανταλλαγή ταχυτήτων

(2): $v_2' = \frac{2m}{m+m}v_1 + \frac{\cancel{m-m}}{m+m}v_2 = \frac{\cancel{2m}}{\cancel{2m}}v_1 = v_1$ $\Big\}$ $v_2' = v_1$

(II) $m_1 \gg m_2$:

$m_1-m_2 \simeq m_1$

$m_1+m_2 \simeq m_1$

$2m_1 = m_1$

$2m_2 \simeq 0$

$m_2-m_1 \simeq -m_1$

(1): $v_1' \simeq \frac{\cancel{m_1}}{\cancel{m_1}}v_1 + \cancel{\frac{0}{m_1}v_2} \Rightarrow \boxed{v_1' \simeq v_1}$

(2): $v_2' \simeq \frac{2\cancel{m_1}}{\cancel{m_1}}v_1 + \frac{-\cancel{m_1}}{\cancel{m_1}}v_2 \Rightarrow \boxed{v_2' \simeq 2v_1 - v_2}$

(III) $m_1 \ll m_2$:

$m_1-m_2 \simeq -m_2$

$m_1+m_2 \simeq m_2$

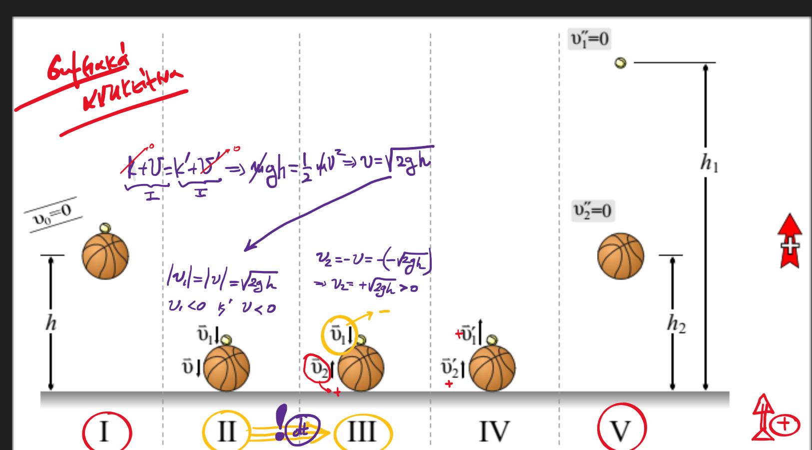
$2m_1 \simeq 0$

$2m_2 = 2m_2$

$m_2-m_1 \simeq m_2$

(1): $v_1' \simeq \frac{-\cancel{m_2}}{\cancel{m_2}}v_1 + \frac{2\cancel{m_2}}{\cancel{m_2}}v_2 \Rightarrow \boxed{v_1' \simeq -v_1 + 2v_2}$

(2): $v_2' \simeq \cancel{\frac{0}{m_2}v_1} + \frac{\cancel{m_2}}{\cancel{m_2}}v_2 \Rightarrow \boxed{v_2' \simeq v_2}$



$v_1' = \frac{m_1-m_2}{m_1+m_2}v_1 + \frac{2m_2}{m_1+m_2}v_2$

$v_2' = \frac{2m_1}{m_1+m_2}v_1 + \frac{m_2-m_1}{m_1+m_2}v_2$

basket: M → 2, tennis: m → 1

$v_1' = \frac{m-M}{m+M}(v_1) + \frac{2M}{m+M}v_2$

$v_2' = \frac{2m}{m+M}(v_1) + \frac{M-m}{m+M}v_2$

$M \gg m$:

$m-M \simeq -M$

$m+M \simeq M$

$2M = 2M$

$2m \simeq 0$

$M-m \simeq M$

$v_1' \simeq \frac{-\cancel{M}}{\cancel{M}}(-v_1) + \frac{2\cancel{M}}{\cancel{M}}v_2 \Rightarrow \boxed{v_1' \simeq +v_1 + 2v_2} \Rightarrow v_1' \simeq \sqrt{2gh} + 2\cdot\sqrt{2gh} \Rightarrow \boxed{v_1' \simeq 3\sqrt{2gh}}$

$v_2' \simeq \cancel{\frac{0}{M}v_1} + \frac{M}{M}v_2 \Rightarrow \boxed{v_2' \simeq v_2} \Rightarrow \boxed{v_2' \simeq \sqrt{2gh}}$

ΑΔΜΕ (basket): $\cancel{K}+\cancel{U} = \cancel{K'}+U' \Rightarrow \frac{1}{2}\cancel{M}\cdot v_2'^2 = \cancel{M}\cdot g\cdot h_2 \Rightarrow h_2 = \frac{v_2'^2}{2g} = \frac{2gh}{2g} \Rightarrow \boxed{h_2=h}$

δηλ. η basket φτάνει στο αρχικό της ύψος

ΑΔΜΕ (tennis): $K+\cancel{U} = \cancel{K'}+U' \Rightarrow \frac{1}{2}\cancel{m}v_1'^2 = \cancel{m}gh_1 \Rightarrow$

$\Rightarrow \frac{1}{2}v_1'^2 = gh_1 \Rightarrow h_1 = \frac{v_1'^2}{2g} = \frac{9\cdot\cancel{2g}h}{\cancel{2g}} \Rightarrow \boxed{h_1 = 9h}$

η tennis φτάνει σε 9-πλάσιο ύψος από το αρχικό που την αφήσαμε.