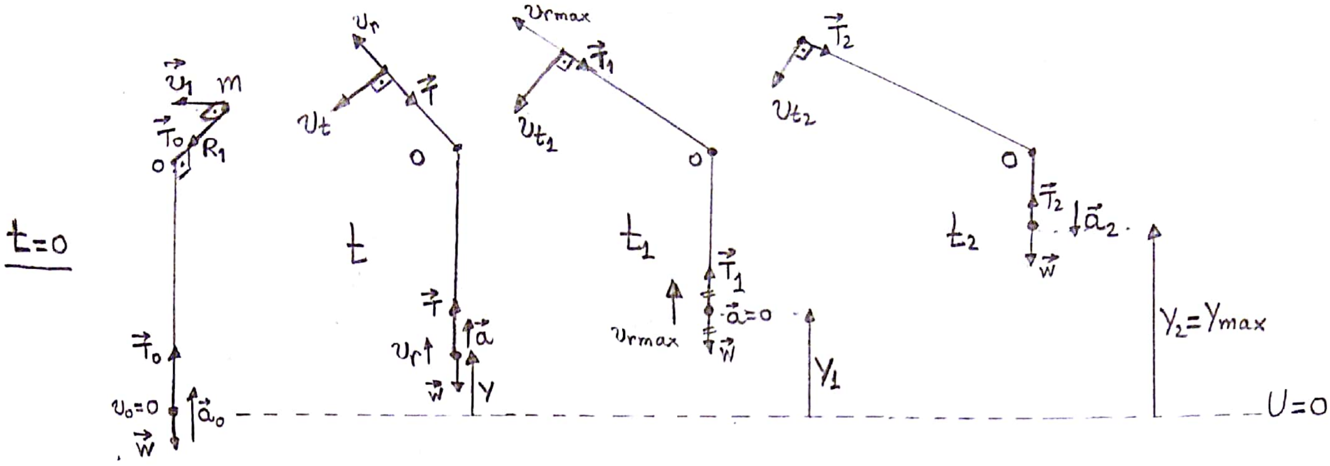
$\Sigma_1 : m/2 \oplus \Sigma_3 : m/2$ με $v_0 = 8m/s$ $(m = 1kgr)$

$\Sigma_2 : m$ και αρχικά θα έχουμε $R_1 = 0.2m$




$\underline{t=0}$ : ΑΔΟ : $\frac{m}{2} \cdot v_0 = m \cdot v_1 \Rightarrow v_1 = v_0/2 = 4m/s$

$T_0 = \frac{m \cdot v_1^2}{R_1} = 80N = 8mg$ τότε $\Sigma_2 : a_0 = \frac{8mg - mg}{m} \Rightarrow a_0 = 7g \ (\uparrow)$

$\underline{t}$ : $\left.\begin{array}{l} \text{ΑΔΣ}_T(o) : m \cdot v_1 \cdot R_1 = m \cdot v_t \cdot R \Rightarrow v_t = v_1 \cdot \frac{R_1}{R} \\ \text{όμως αρχικά } v_r \uparrow \text{ άρα } R\uparrow \end{array}\right\} \Rightarrow v_t \downarrow \quad \left.\begin{array}{l} \\ T = \frac{m \cdot v_t^2}{R} \Rightarrow T = \frac{m \cdot v_t^3}{v_1 \cdot R_1} \end{array}\right\} \Rightarrow T \downarrow$

Για το $\Sigma_2$ : $a = \frac{T}{m} - g \xRightarrow{T\downarrow} a\downarrow$ μέχρι $a = 0 \rightsquigarrow v_r = v_{rmax}$ την $\underline{\underline{t_1}}$.

μετά $T < mg \rightsquigarrow$ επιβραδυνόμενη κίνηση μέχρι το $v_r = 0$ την $\underline{\underline{t_2}}$.
(Το $v_r \downarrow$ αλλά έχει φορά προς τα πάνω $\rightsquigarrow R\uparrow$)

ΑΔΕ : $mgY + \frac{1}{2} m \cdot v_r^2 + \frac{1}{2} m (v_r^2 + v_t^2) = \frac{1}{2} m \cdot v_1^2 \Rightarrow 2gY + 2 \cdot v_r^2 + v_t^2 = v_1^2 \Rightarrow$

$\Rightarrow v_1^2 = v_t^2 + 2 \cdot v_r^2 + 2g \cdot Y \Rightarrow v_r = \sqrt{0.5(v_1^2 - v_t^2) - gY}$ (1)

$\underline{t_1}$ : $a = 0 \rightsquigarrow T_1 = mg \Rightarrow \frac{m \cdot v_{t_1}^3}{v_1 \cdot R_1} = m \cdot g \Rightarrow v_{t_1} = \sqrt[3]{v_1 \cdot g \cdot R_1} = 2m/s$

Τότε ΑΔΣτρ. $R(t_1) = \frac{v_1 \cdot R_1}{v_{t_1}} \Rightarrow R(t_1) = 0.4m$

κ' $Y_1 = R(t_1) - R_1 \Rightarrow Y_1 = 0.2m$

(1) $\rightsquigarrow v_{r_1} = 2m/s$ άρα $v(t_1) = 2\sqrt{2}\ m/s$.

$\underline{t_2}$: $v_r = 0$ κ' $a = g - \frac{T_2}{m}$ τότε έχουμε $y_{max} = R_{max} - R_1$

$$① \rightsquigarrow v_1^2 = v_{t_2}^2 + 2g \cdot y_{max}$$

$$\text{ΑΔΣτρ.}: v_{t_2} = \frac{v_1 \cdot R_1}{R_{max}}$$

$$\Rightarrow v_1^2 = \frac{R_1^2}{R_{max}^2} \cdot v_1^2 + 2g \cdot (R_{max} - R_1) \Rightarrow$$

$$\Rightarrow v_1^2 \cdot \frac{R_{max}^2 - R_1^2}{R_{max}^2} = 2g \cdot (R_{max} - R_1) \Rightarrow$$

$$\Rightarrow \frac{v_1^2}{2g} \cdot \frac{(R_{max} - R_1) \cdot (R_{max} + R_1)}{R_{max}^2} = R_{max} - R_1 \xRightarrow{R_{max} \neq R_1}$$

$$\Rightarrow \frac{v_1^2}{2g} \cdot (R_{max} + R_1) = R_{max}^2 \Rightarrow 2g \cdot R_{max}^2 - v_1^2 \cdot R_{max} - v_1^2 \cdot R_1 = 0 \Rightarrow$$

$$\Rightarrow 20 \cdot R_{max}^2 - 16 \cdot R_{max} - 3.2 = 0 \Rightarrow 5 \cdot R_{max}^2 - 4 \cdot R_{max} - 0.8 = 0$$

Τότε: $\Delta' = 4 + 4 = 8 \rightsquigarrow R_{max} = \frac{2 + 2\sqrt{2}}{5} m \simeq 0.964 m$ $(\sqrt{2} \simeq 1.41)$

Επομένως: $y_{max} = 0.764 m$

κ' $v_{t_2} = \frac{v_1 \cdot R_1}{R_{max}} \Rightarrow v_{t_2} \simeq 0.83 m/s$, $v_r = 0$.

$$T_2 = \frac{m \cdot v_{t_2}^2}{R_{max}} \simeq 0.715 N \rightsquigarrow a = g - \frac{T_2}{m} \Rightarrow a = 9.285 m/s^2$$