27.10.2020

1.20 – Rezolvarea pb (MRU-MRUV)

$t \to (t+\Delta t)$

2/92 $x(t) = 2 + 1{,}5t + t^2$ $\quad v_m = \left(\frac{\Delta x}{\Delta t}\right) = \frac{x(t+\Delta t) - x(t)}{\Delta t}$

$v(t) = ?$

$x(t+\Delta t) = 2 + 1{,}5(t+\Delta t) + (\Delta t + t)^2 = 2 + 1{,}5t + 1{,}5\Delta t + t^2 + 2t\Delta t + \Delta t^2 =$

$x(t+\Delta t) = 2 + t\cdot(1{,}5 + 2\Delta t) + 1{,}5\Delta t + t^2 + \Delta t^2$

$v_m = \frac{x(t+\Delta t) - x(t)}{\Delta t} = \frac{[2 + 1{,}5t + 2t\Delta t + 1{,}5\Delta t + t^2 + \Delta t^2] - [2 + 1{,}5t + t^2]}{\Delta t}$ (=)

(=) $\frac{2t\Delta t + 1{,}5\Delta t + \Delta t^2}{\Delta t} = 2t + 1{,}5 + \Delta t$, $\Delta t \gg 1$. $\to (v_m)$

$v = \frac{\Delta x}{\Delta t}$, $\Delta t \to 0$ (v = instantaneous).

$v = 2t + 1{,}5$ $(\Delta t = 0)$

5/93 $v_0 = 72\ km/h = 20\ m/s$

$t_u = \Delta t = 20\ s$ $(v = 0)$

$a = ?$

$x_u = ?$

$V = V_0 - at$ (1)

$v^2 = v_0^2 - 2ax$ (3)

$V = 0$ → coord. de oprire. Facem $V = 0$ în ec. (1) și (3)

(1) $0 = v_0 - a\cdot t_u \to t_u = \left(\frac{v_0}{a}\right) \to a = \left[\frac{v_0}{t_u}\right] = \frac{20}{20} = 1\ m/s^2$

(3) $v^2 = 0 = v_0^2 - 2ax_u \to x_u = \frac{v_0^2}{2a} = \frac{v_0^2}{2\left(\frac{v_0}{t_u}\right)} = \frac{v_0 \cdot t_u}{2}$

deci $x_u = \frac{20\ m/s \cdot 20\ s}{2} = \frac{400}{2} = 200\ m$

6/93 $a = 0{,}4\ m/s^2$

$v_1 = 12\ m/s$

$v_2 = 20\ m/s$

$t = ?$

$x = x_0 + v_0 t \pm \frac{at^2}{2}$

$v = v_0 \pm at$

$v^2 = v_0^2 \pm 2ax$

$a > 0$.

$x = v_0 t + at^2/2$

$v = v_0 + at$ (1) $\to v_2 = v_1 + a\cdot t$

$v^2 = v_0^2 + 2ax$ (3)

deoc. $v_0 = v_1$, $v = v_2$

$v_2 - v_1 = a\cdot t$

$t = \left(\frac{v_2 - v_1}{a}\right)$

deci $t = \frac{20-12}{0{,}4} = \frac{8}{0{,}4} = \frac{80}{4} = 20\ s$

7/93 $l = 60\ m$

$t = 10\ s$

$a = ?$

$v = ?$

$v^2 = v_0^2 + 2ax$

$V = V_0 + at$

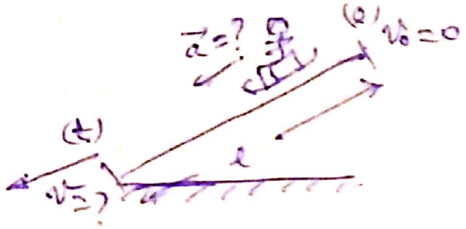
$x = v_0 t + \frac{at^2}{2}$

$v_0 = 0$ → pleacă din repaus.

$\Rightarrow v^2 = 2ax$

$v = at$ (*)

$x = \frac{at^2}{2}$



$a = \frac{2x}{t^2} = \frac{2\cdot 60\ m}{100\ s^2} = \frac{120}{100}\ m/s^2 = 1{,}2\ m/s^2$

(*) $v = at = \frac{2x}{t^2}\cdot t = \frac{2x}{t} = \frac{2\cdot 60}{10} = 12\ m/s$

8/93 $a = 0{,}3\ m/s^2$

$\Delta x = 100\ m$

$\Delta t = 20\ s$

$v_0 = ?$

$v = ?$

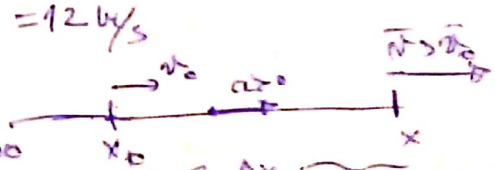
$x = v_0 t + \frac{at^2}{2}$

$v = v_0 + at$

$v^2 = v_0^2 + 2ax$

$v_0 = \frac{2x - at^2}{2t}$

$v_0 = \frac{2\cdot 100 - 0{,}3\cdot 400}{2\cdot 20} = \frac{200 - 120}{40} = \frac{8}{4} = 2\ m/s$



$v = v_0 + at = 2 + 0{,}3\cdot 20 = 2 + 6 = 8\ m/s$