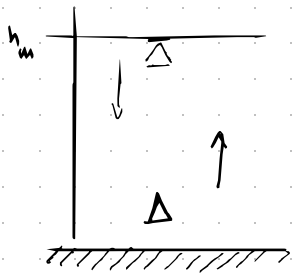
KINEMATIKA

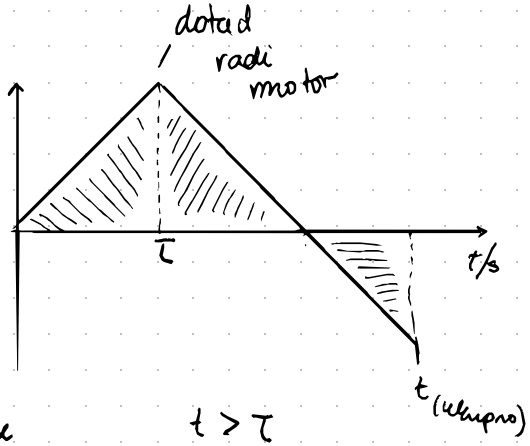
1. $v_0 = 0 m/s$

$\tau = 15 s$

$h_{max}?$

$a = 2g$





$v = 2gt$ slobodni pad $t > \tau$

$\xrightarrow{*}$ dobijemo integracijom $\longrightarrow x[t] = gt^2$

$v = \frac{\Delta x}{\Delta t}$ → brzina je derivacija puta u vremenu

$\Leftrightarrow \quad v[t] = \frac{dx}{dt} \quad / \int$

$\int 2gt\,dt = x[t]$

$2g \int t\,dt = x[t] \longrightarrow 2g \cdot \frac{1}{2} t^2 = x[t] \Rightarrow x[t] = gt^2$

$\Delta t = t - \tau$

$\Rightarrow$

$x_0[t] = gt^2$

2.) $y(t) = (2\,cm) \cdot \sin(\omega t)$

$\omega = \frac{\pi}{4s}$ $\qquad v[t] = \frac{dy(t)}{dt} = 2\cos(\omega t) \cdot \omega$

$v[1] = ?$ $\qquad \Rightarrow \underline{v[t] = 2\omega \cdot \cos(\omega t)}$

$\bar{v}[0,2] = ?$

$\bar{a}, a$?

$$v[t] = 2 \cdot \frac{\pi}{4s} \cdot \cos\left(\frac{\pi}{4} t\right) = \frac{\pi}{2s} \cos\left(\frac{\pi}{4} t\right)$$

Srednja brzina = $\frac{\text{ukupni put}}{\text{ukupno vrijeme}} \rightarrow \bar{v} = \frac{1}{t_1 - t_0} \int_{t_0}^{t_1} |v(t)|\, dt$

$\underline{v[1] = \frac{\pi}{2s} \cos\left(\frac{\pi}{4s}\right)}$

$$\bar{v}[0,2] = \frac{1}{2} \int_0^2 \frac{\pi}{2s} \cos\left(\frac{\pi}{4} t\right) dt = \frac{\pi}{4s} \int_0^2 \cos\left(\frac{\pi}{4} t\right) dt$$

$$= \frac{\pi}{4s} \cdot \sin\left(\frac{\pi}{4} t\right) \Big|_0^2 \cdot \frac{4s}{\pi} = \sin\left(\frac{\pi}{4} \cdot 2\right) - \underbrace{\sin\left(\frac{\pi}{4} \cdot 0\right)}_{0}$$

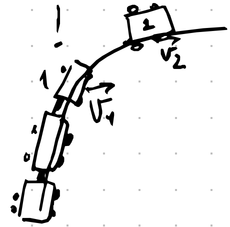
$\underline{\bar{v}[0,2] = 1}$

3. $v_1 = 161 \, km/h$

$v_2 = 29 \, km/h$

$D = 676 \, m$

$a_{min} = ?$ (treba zaustaviti vlak)



$x_1[t] = \underset{v_1}{v_0} t - \frac{at^2}{2} - D$

$x_2[t] = \underset{v_2}{v_0} t$

ZAUSTAVLJANJE: $v = v_0 - at$ (na kraju se zaustavi)

$v_1[t] = \frac{dx[t]}{dt} = 0$

$v_1[t] - a[t] t_1 = 0 \quad \Rightarrow \quad 161 \, km/h - a[t] \cdot t_1 = 0$

$t_1 = \frac{161 \, km/h}{a[t]} = \frac{v_1[t]}{a[t]}$

→ minimalno kočenje bi približilo vlakove skroz (bez da se sudare)

↪ $x_1[t] = x_2[t]$ (zato oduzimamo D)

$v_1 t - \frac{at^2}{2} - D = v_2 t$

$\frac{v_1^2}{a} - \frac{a}{2} \cdot \frac{v_1^2}{a^2} - D = v_2 \cdot \frac{v_1}{a}$

$\frac{29000}{3600}$

$-676 \, m = \frac{29 \cdot 161}{a}$

$-676 \, m = \frac{290}{36} \cdot \frac{1610}{36} \cdot \frac{1}{a}$

$a = \frac{290 \cdot 1610}{36^2} \cdot \frac{1}{676}$