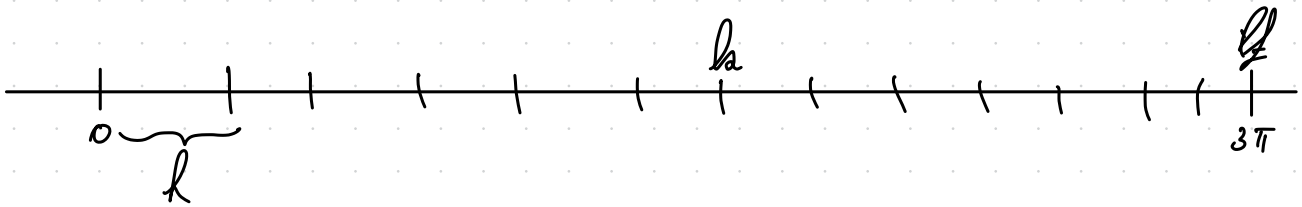
$$\begin{cases} \dot{x}_1 = x_2 \\ \dot{x}_2 = -x_1 \end{cases} \qquad \begin{matrix} x_1(0) = 0 \\ x_2(0) = 1 \\ t \in [0, 3\pi] \end{matrix}$$

EULER

$\dot{x} = f(x) \qquad t \in [0, 3\pi]$



$h = 0.1 \qquad t = 0 : h : ff$

$ff = 3\pi \qquad N = length(t)$

$N = ?$

$$\dot{x}|_k \approx \frac{x_{k+1} - x_k}{h} = f(x_k)$$

$$\boxed{x_{k+1} = x_k + h \cdot f(x_k)}$$

DACĂ AM CONDIȚII FINALE => ÎNTEGREZ DE LA FINAL LA CAP

$$\dot{x} = f(x) \qquad x(ff) = xf$$

$$\dot{x}|_k \approx \frac{x_k - x_{k-1}}{h} = f(x_k)$$

$$x_k - x_{k-1} = h f(x_k) \Rightarrow \boxed{x_{k-1} = x_k - h f(x_k)}$$

PROBLEMĂ MOLOCOTIVĂ

$z_1 = x_1$ $\quad M_1 = 1$ $\quad u(t) = F(t)$

$z_2 = \dot{x}_1$ $\quad M_2 = 0.5$

$z_3 = x_2$ $\quad k = 1$

$\mu = 0.002$

$z_4 = \dot{x}_2$ $\quad g = 9.8$

$$\dot{z}_2 = \ddot{x}_1 = \frac{u(t) - k(x_1(t) - x_2(t)) - \mu \cdot M_1 \cdot g \cdot \dot{x}_1(t)}{M_1}$$

$$\dot{z}_1 = \dot{x}_1 = z_2$$

$$\dot{z}_3 = \dot{x}_2 = z_4$$

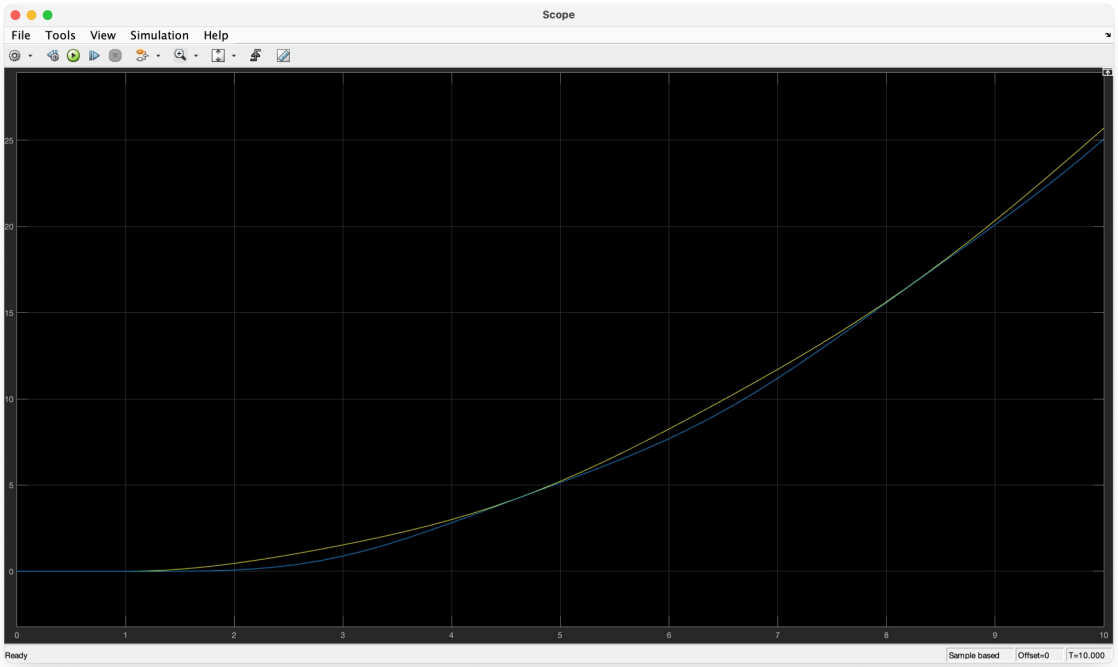
$$\dot{z}_4 = \ddot{x}_2 = \frac{k(x_1(t) - x_2(t)) - \mu \cdot M_2 \cdot g \cdot \dot{x}_2(t)}{M_2}$$

$$\begin{cases} \dot{z}_1 = z_2 \\ \dot{z}_2 = u(t) - z_1 + z_3 - \mu \cdot g \cdot z_2 \\ \dot{z}_3 = z_4 \\ \dot{z}_4 = 2 \cdot z_1 - 2 \cdot z_3 - \mu \cdot g \cdot z_4 \end{cases}$$

$$A = \begin{bmatrix} 0 & 1 & 0 & 0 \\ -1 & -\mu \cdot g & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 2 & 0 & -2 & -\mu \cdot g \end{bmatrix} \qquad B = \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

$$D = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$



DIN CAUZA ARCULUI LOCOMOTIVA SE TOT LOVEȘTE DE VAGON ȘI DE ACEEA APARE AȘA GRAFICUL