

## Vibrazioni con forzante a rampa

$$F_0 := 180$$

$$m := 4$$

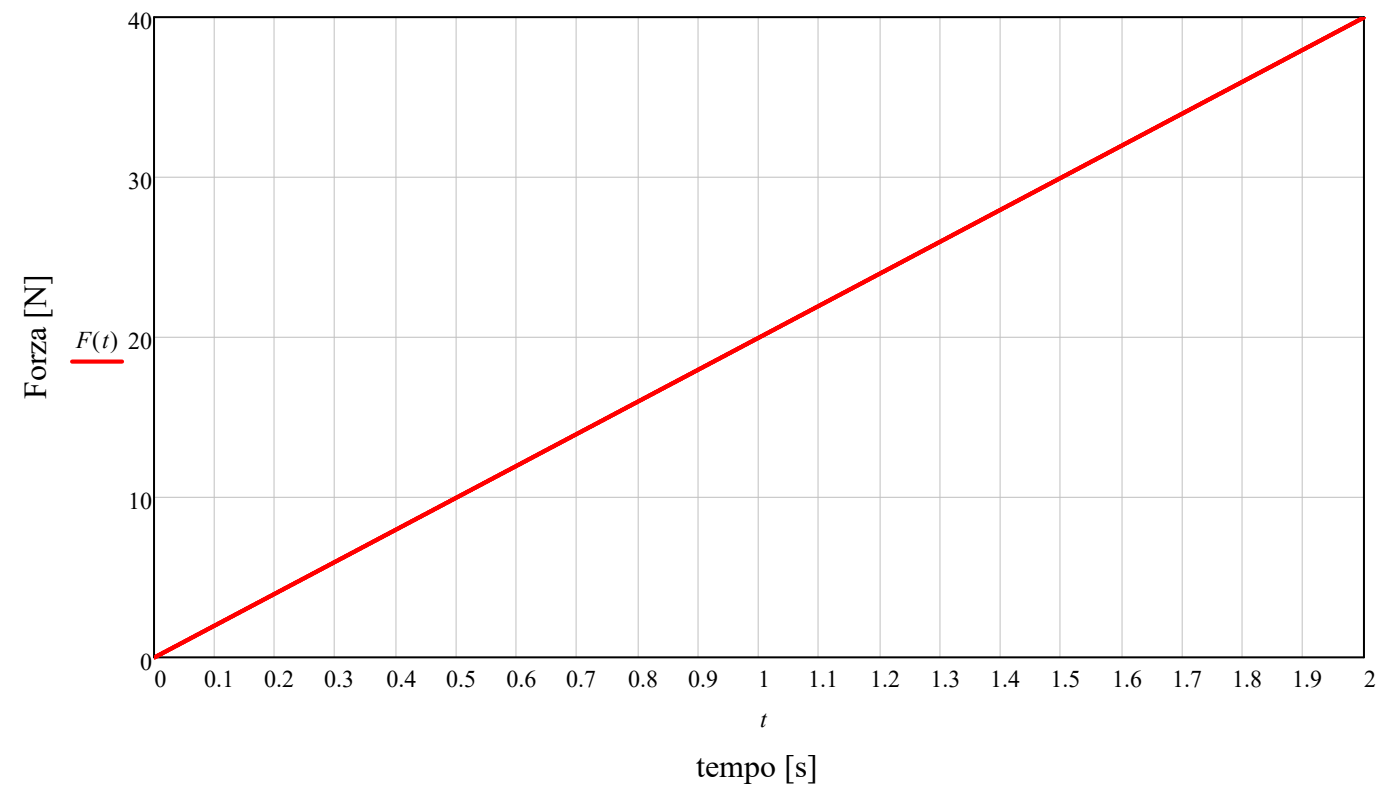
$$c := 10$$

$$k := 1000$$

$$a := 20 \quad \underline{F(t)} := a \cdot t$$

$$T_{max} := 2 \quad \Delta t := 10^{-3}$$

$$t := 0, \Delta t .. T_{max}$$



### Calcolo dei coefficienti della soluzione particolare

$$b_1 := \frac{a}{k} = 0.02$$

$$b_0 := \frac{-a \cdot c}{k^2} = -2 \times 10^{-4}$$

$$x_{part}(t) := b_1 \cdot t + b_0$$

## Pulsazione propria, pulsazione propria smorzata e fattore di smorzamento

$$\omega := \sqrt{\frac{k}{m}} = 15.811 \quad \xi := \frac{c}{2 \cdot m \cdot \omega} = 0.079 \quad \omega_s := \omega \cdot \sqrt{1 - \xi^2} = 15.762$$

## Costanti di integrazione

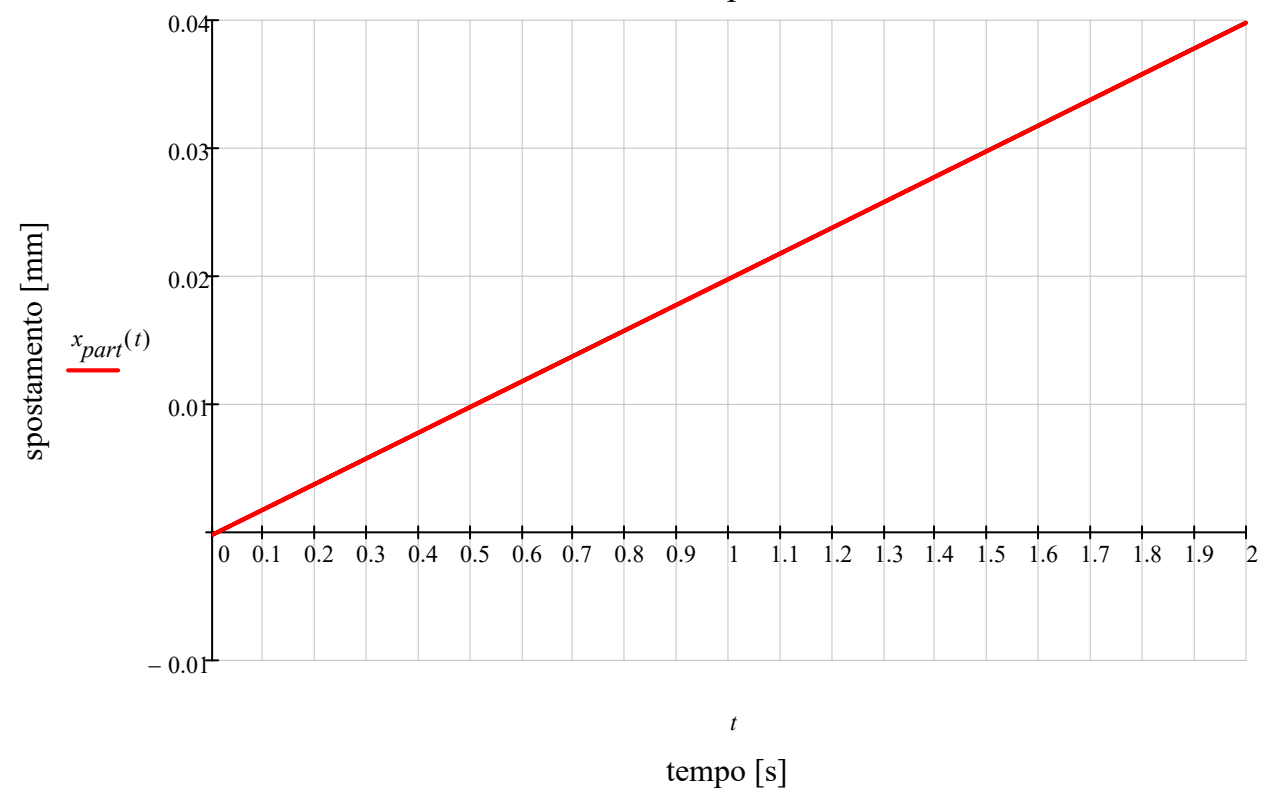
$$\begin{pmatrix} A \\ B \end{pmatrix} := \begin{pmatrix} \frac{a \cdot c}{k^2} \\ \frac{a}{\omega_s \cdot k} \cdot \left( \frac{\xi \cdot \omega \cdot c}{k} - 1 \right) \end{pmatrix} = \begin{pmatrix} 2 \times 10^{-4} \\ -1.253 \times 10^{-3} \end{pmatrix}$$

$$x_{omo}(t) := e^{-\xi \cdot \omega \cdot t} \cdot (A \cdot \cos(\omega_s \cdot t) + B \cdot \sin(\omega_s \cdot t))$$

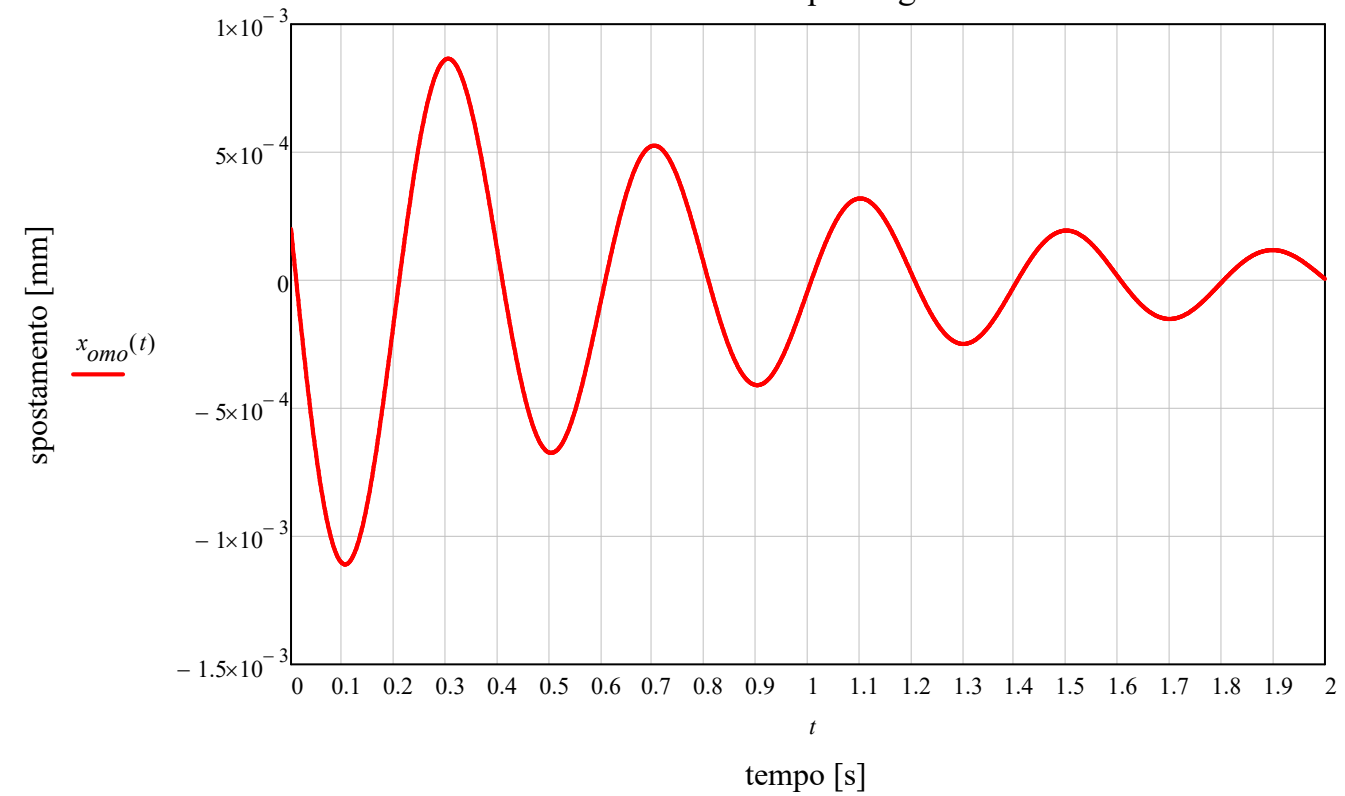
$$x(t) := x_{omo}(t) + x_{part}(t)$$

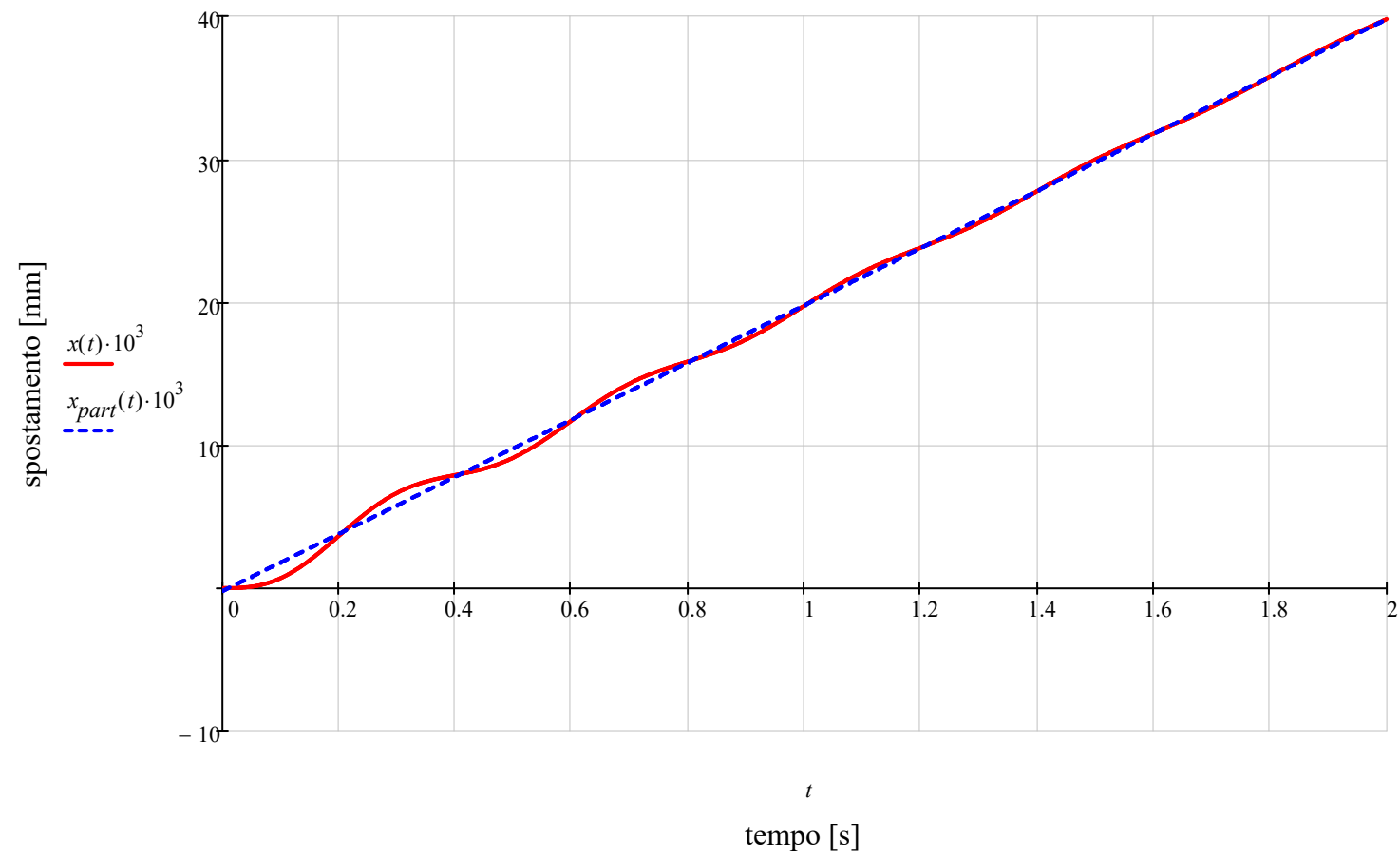
$$x'(t) := \frac{d}{dt} x(t) \quad x''(t) := \frac{d}{dt} x'(t)$$

Soluzione particolare



Soluzione eq. omogenea





### Integrazione per via numerica

$$\mathbf{F}_{(x,x',t)} := \frac{1}{m} \cdot (F(t) - c \cdot x' - k \cdot x)$$

$$u := \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

$$N := \frac{T_{max}}{\Delta t} = 2000$$

$$EQMOTO(t,u) := \begin{pmatrix} u_2 \\ \mathbf{F}(u_1, u_2, t) \end{pmatrix}$$

$$TAB := rkfixed(u, 0, T_{max}, N, EQMOTO)$$

$$tempo := TAB^{\langle 1 \rangle}$$

$$SPO := TAB^{\langle 2 \rangle}$$

$$VEL := TAB^{\langle 3 \rangle}$$

$$ACC := \overrightarrow{\mathbf{F}}(SPO, VEL, tempo)$$

