21/11/2023

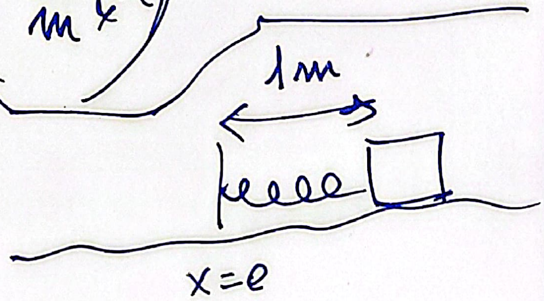
$$\boxed{m\ddot{x} = -Kx} \qquad \frac{d^2}{dt^2}x = -\frac{K}{m}x \qquad x(t): \mathbb{R} \to \mathbb{R}$$

$$\underline{X}(t) := \begin{pmatrix} x(t) \\ v(t) \end{pmatrix} \qquad \frac{d}{dt}\underline{X}(t) = \begin{pmatrix} v(t) \\ a(t) \end{pmatrix} = \begin{pmatrix} v(t) \\ -\frac{K}{m}x(t) \end{pmatrix}$$

Risolvo il problema di Cauchy:

$$\frac{K}{m} = 1\,s^{-2}$$

$$\underline{X}(t=0) = \begin{pmatrix} x(t=0) \\ v(t=0) \end{pmatrix} = \begin{pmatrix} 1\,m \\ 0\,m/s \end{pmatrix}$$



Uso il metodo di Eulero:

$h = 0{,}1\,s$

Formula generale:

$$\underline{X}(t_0 + h) = \underline{X}(t_0) + h\,\underline{X}'(t_0) + o(h)$$

Nel nostro caso:

$$\underline{X}(0+h) \approx \underline{X}(0) + h\,\underline{X}'(0) =$$

$$= \begin{pmatrix} 1\,m \\ 0\,m/s \end{pmatrix} + 0{,}1\,s \cdot \left.\begin{pmatrix} v(t) \\ -\frac{K}{m}x(t) \end{pmatrix}\right|_{t=0} =$$

$$= \begin{pmatrix} 1\,m \\ 0\,m/s \end{pmatrix} + 0{,}1\,s \begin{pmatrix} 0\,m/s \\ -1\,s^{-2} \cdot 1\,m \end{pmatrix} = \begin{pmatrix} 1\,m \\ -0{,}1\,m/s \end{pmatrix}$$