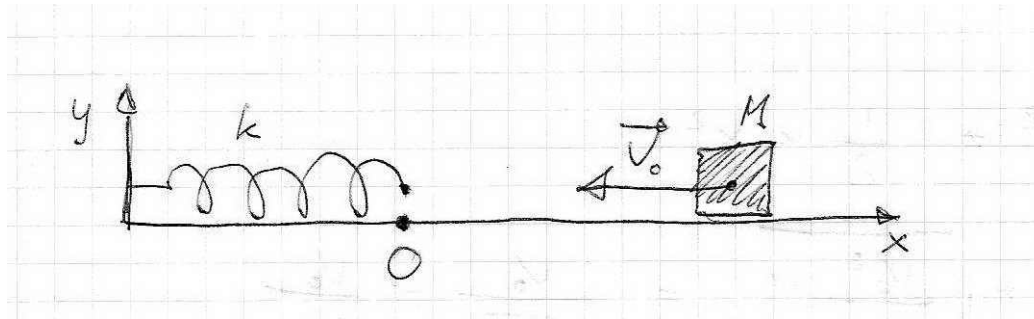


# Esercizio risolto: moto armonico



A partire da  $t = 0$

$$F = -kx$$
$$M \frac{d^2x}{dt^2} = -kx$$

$$\text{con } \begin{cases} V_0 = -V_0 \hat{x} \\ x_0 = 0 \end{cases}$$

$$x = A \sin \omega t + B \cos \omega t \quad \omega = \sqrt{\frac{k}{M}}$$

$$\text{con } \begin{cases} V_0 = -V_0 \hat{x} \\ x_0 = 0 \end{cases}$$

$$x(0) = B = 0$$

$$V_x = A\omega \cos \omega t - B\omega \sin \omega t$$

$$V_x(0) = A\omega = -V_0 \Rightarrow A = -\frac{V_0}{\omega}$$

$$x(t) = -\frac{V_0}{\omega} \sin \omega t \quad \omega = \sqrt{\frac{k}{M}}$$

Esempio numerico:

$$k = 2000 \text{ N/m}$$

$$M = 5 \text{ kg}$$

$$v_0 = 2 \text{ m/s}$$

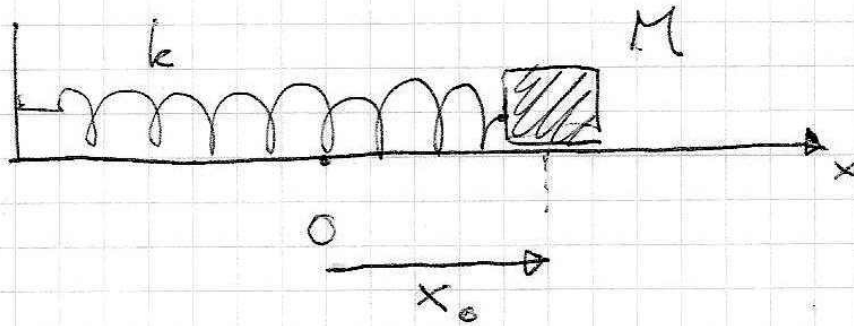
$$\omega = 20 \text{ s}^{-1}$$

$$T = \frac{2\pi}{\omega} = 0.314 \text{ s}$$

$$x = -0.1 \sin 20t \quad \text{m}$$

Di quanto si comprimerà la molla?

$$x_{\min} = -0.1 \text{ m}$$



$$x(0) = +x_0$$

$$v(0) = 0$$

$$x = A \sin \omega t + B \cos \omega t$$

$$x(0) = B = x_0$$

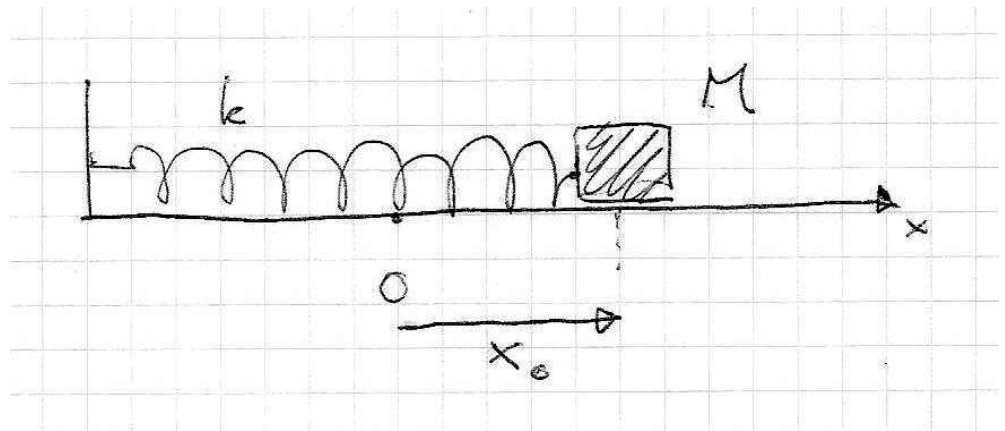
$$\dot{x} = A\omega \cos \omega t - B\omega \sin \omega t$$

$$v_x(0) = A\omega = 0 \implies A = 0$$

$$x(t) = x_0 \cos \omega t$$

$$\omega = \sqrt{\frac{k}{M}}$$

Durante l'oscillazione di una massa  $M = 0.5 \text{ kg}$  attaccata ad una molla di costante elastica  $k = 200 \text{ N/m}$  si rilevano, all'istante  $t = 0$ , i seguenti dati:

$$v_x(0) = 3 \text{ m/s}$$
$$x(0) = 50 \text{ cm}$$


Qual è la legge oraria del moto?

$$k = 200 \text{ N/m}$$

$$M = 0.5 \text{ kg}$$

$$\omega = \sqrt{\frac{200}{0.5}} = 20 \text{ s}^{-1}$$

$$x = A \sin \omega t + B \cos \omega t$$

$$x(0) = B = x_0$$

$$= 0.5 \text{ m}$$

$$\dot{v}_x = A\omega \cos \omega t - B\omega \sin \omega t$$

$$v_x(0) = A\omega$$

$$= 3 \text{ m/s}$$

$$A = 0.15 \text{ m}$$

$$x = 0.15 \sin 20t + 0.5 \cos 20t$$

$$x = 0.15 \sin 20t + 0.5 \cos 20t$$

$x(t)$

