Slobodne neprigušene vibracije SDOF

- Nema uzbudne sile
- Vibracije nastaju uslijed početnog pomaka x i/ili početne brzine $\dot{x}$.

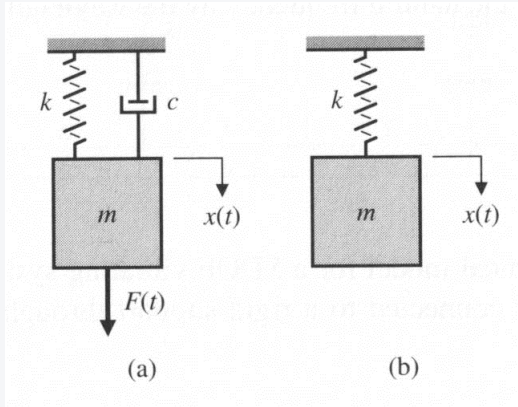
Jednostavno harmonijsko gibanje

Jednadžba gibanja

$$m\ddot{x} + kx = 0$$

$$\ddot{x} + \frac{k}{m}x = 0$$

$$\ddot{x} + \omega^2 x = 0$$

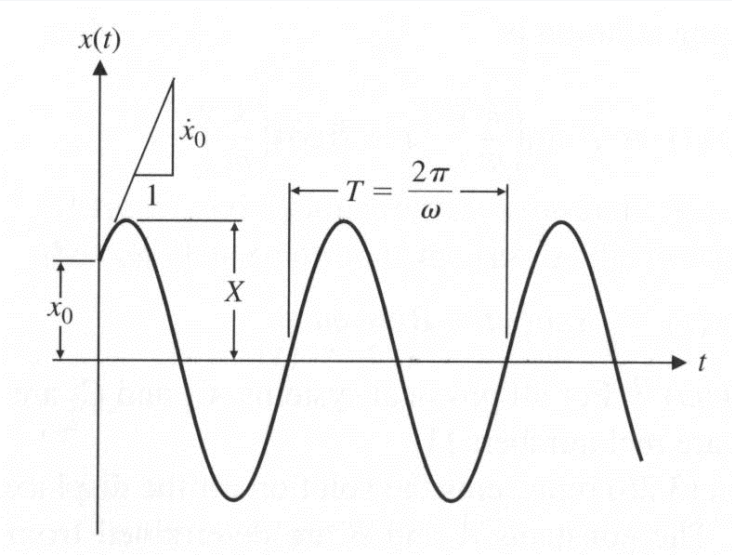


Rješenje jednadžbe gibanja

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

Uz početne uvjete za *t=0*

$$x(t) = \frac{\dot{x}_0}{\omega}\sin\omega t + x_0\cos\omega t$$



Period vibracija

$$T = \frac{2\pi}{\omega}$$

SLOBODNE NEPRIGUŠENE VIBRACIJE

Interpretacija rješenja

$$x(t) = X\sin(\omega t + \varphi)$$

amplituda $$X = \sqrt{x_0^2 + \left(\frac{\dot{x}_0}{\omega}\right)^2}$$

fazni pomak $$\varphi = arctg\left(\frac{x_0\omega}{\dot{x}_0}\right)$$

brzina $$\dot{x}(t) = X\omega\cos(\omega t + \varphi)$$

ubrzanje $$\ddot{x}(t) = -X\omega^2\sin(\omega t + \varphi)$$

Vlastita (prirodna) frekvencija

$$f = \frac{1}{T} = \frac{\omega}{2\pi}\ [Hz]$$

