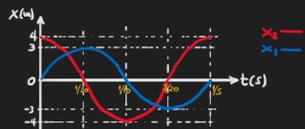


ΔΕ 24-1-2022



$x_1 = 3 \cdot \sin 10\pi t$
 $x_2 = 4 \cdot \sin(10\pi t + \pi/2) \rightarrow x_2 = 4 \cdot \cos 10\pi t$



$x = x_1 + x_2 = A \cdot \sin(\omega t + \theta)$
 $A = \sqrt{A_1^2 + A_2^2 + 2A_1A_2 \cos \phi} \Rightarrow A = 5 \text{ m}$
 $\cos \theta = \frac{A_1 \cos \phi + A_2}{A} \Rightarrow \cos \theta = 4/5$

αφ'ησιν άμφότερων (άφω των φάσεων)
 με 2(άφω 5 m)
 με περίοδο: $T = \frac{2\pi}{\omega} = \frac{1}{5} \text{ sec}$
 να ξεκινήσει από τον θάτο:
 $t=0: x = 5 \cdot \sin(10\pi \cdot 0 + \theta) = 5 \cdot \sin \theta$

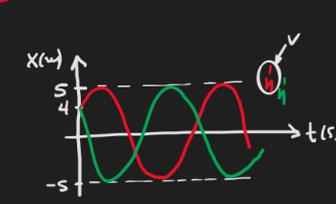
$\cos \theta = \frac{4}{5} \Rightarrow \frac{4}{5} = \frac{\sin \theta}{\sqrt{1 - \cos^2 \theta}} \Rightarrow \dots$
 άίστο

$v_1 = \omega A_1 \cos \omega t = 10\pi \cdot 3 \cdot \cos 10\pi t = 30\pi \cdot \cos 10\pi t$
 $v_2 = \omega A_2 \cos(\omega t + \phi) = 10\pi \cdot 4 \cdot \cos(10\pi t + \pi/2) = 40\pi \cdot \sin 10\pi t$

$x_1 = 3 \cdot \sin 10\pi t$
 $x_2 = 4 \cdot \cos(10\pi t + \pi/2)$

$x = x_1 + x_2 \Rightarrow x(t) = x_1(t) + x_2(t)$
 $\stackrel{t=0}{\Rightarrow} x(0) = x_1(0) + x_2(0) = 3 \cdot \sin 0 + 4 \cdot \cos(\pi/2) = 3 \cdot 0 + 4 \cdot 0 = 0$
 $= 3 \cdot 0 + 4 \cdot 0 = 0$

Παρατήρηση: $\frac{dx}{dt} = \frac{dx_1}{dt} + \frac{dx_2}{dt} \Rightarrow v = v_1 + v_2 \Rightarrow v(t) = v_1(t) + v_2(t) \Rightarrow$
 $\Rightarrow v(0) = v_1(0) + v_2(0) \Rightarrow$
 $\Rightarrow v(0) = 30\pi \cdot \cos 0 + 40\pi \cdot \sin(\pi/2) = 30\pi \cdot 1 + 40\pi \cdot 1 = 70\pi \text{ m/s} > 0$



$x(0) = 4 \text{ m}$
 $v(0) > 0$
 $A = 5 \text{ m}$
 $T = 1/5 \text{ s}$

$x = 5 \cdot \sin(10\pi t + \theta)$
 άνω $\cos \theta = 4/5$

Άσκηση:

$x_1 = 10 \cdot \sin 2\pi t$
 $x_2 = A_2 \cdot \sin(2\pi t + \phi)$
 $x = x_1 + x_2$
 $x = 10\sqrt{3} \cdot \sin(2\pi t + \frac{3\pi}{2})$
 $A_2 = ? \quad \phi = ?$

$A_1 = 10 \text{ m}$
 $\omega = 2\pi \text{ rad/s}$
 $A_2 = ?$
 $\phi = ?$
 $A = 10\sqrt{3} \text{ m}$
 $\theta = \frac{3\pi}{2} \text{ rad}$

$A = \sqrt{A_1^2 + A_2^2 + 2A_1A_2 \cos \phi} \Rightarrow 10\sqrt{3} = \sqrt{10^2 + A_2^2 + 2 \cdot 10 \cdot A_2 \cdot \cos \phi} \Rightarrow$
 $\Rightarrow 300 = 100 + A_2^2 + 20A_2 \cos \phi \Rightarrow$
 $\Rightarrow 200 = A_2^2 + 20A_2 \cos \phi \quad (1)$

$\cos \theta = \frac{A_1 \cos \phi + A_2}{A} \Rightarrow \cos \frac{3\pi}{2} = \frac{10 \cos \phi + A_2}{10\sqrt{3}} \Rightarrow \cos \frac{3\pi}{2} = \frac{10 \cos \phi + A_2}{10\sqrt{3}} \Rightarrow$
 $\Rightarrow 0 = \frac{10 \cos \phi + A_2}{10\sqrt{3}} \Rightarrow 10 \cos \phi + A_2 = 0 \Rightarrow A_2 \cos \phi = -10 \quad (2)$

$\cos \frac{3\pi}{2} = \frac{10 \cos \phi + A_2}{10\sqrt{3}} = \frac{-1}{0} = \infty$ (δεν ορίστηκε)

$(1), (2): 200 = A_2^2 + 20 \cdot (-10) \Rightarrow 200 = A_2^2 - 200 \Rightarrow$
 $\Rightarrow 200 + 200 = A_2^2 \Rightarrow A_2^2 = 400 \Rightarrow$
 $\Rightarrow A_2 = 20 \text{ m}$

$(2): 20 \cos \phi = -10 \Rightarrow \cos \phi = -\frac{1}{2} \Rightarrow \cos \phi = -\frac{1}{2}$
 Δ ίνεται ότι: $\cos \frac{2\pi}{3} = \cos \frac{4\pi}{3} = -\frac{1}{2}$

$\phi = ?$ Next Time

$\cos \phi = -\frac{1}{2} = \cos \frac{2\pi}{3} = \cos(\pi - \frac{2\pi}{3}) = \cos \frac{4\pi}{3}$
 $\phi = 2k\pi + \frac{2\pi}{3} \xrightarrow{k=0} \phi = \frac{2\pi}{3}$
 $\phi = 2k\pi - \frac{2\pi}{3} \xrightarrow{k=0} \phi = -\frac{2\pi}{3}$
 $\phi = 2\pi - \frac{2\pi}{3} = \frac{6\pi}{3} - \frac{2\pi}{3} \Rightarrow \phi = \frac{4\pi}{3}$