

Λόγος με 2 Τρόπους

1ος Τρόπος

Λύνει
7α
Πάντα
($A_1 = A_2$ ή $A_1 \neq A_2$)

!!!
ooo

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$$\begin{aligned} x_1 &= 2 \cdot \psi(10t + \frac{\pi}{3}) \\ x_2 &= 2 \cdot \psi(10t - \frac{\pi}{6}) \end{aligned}$$

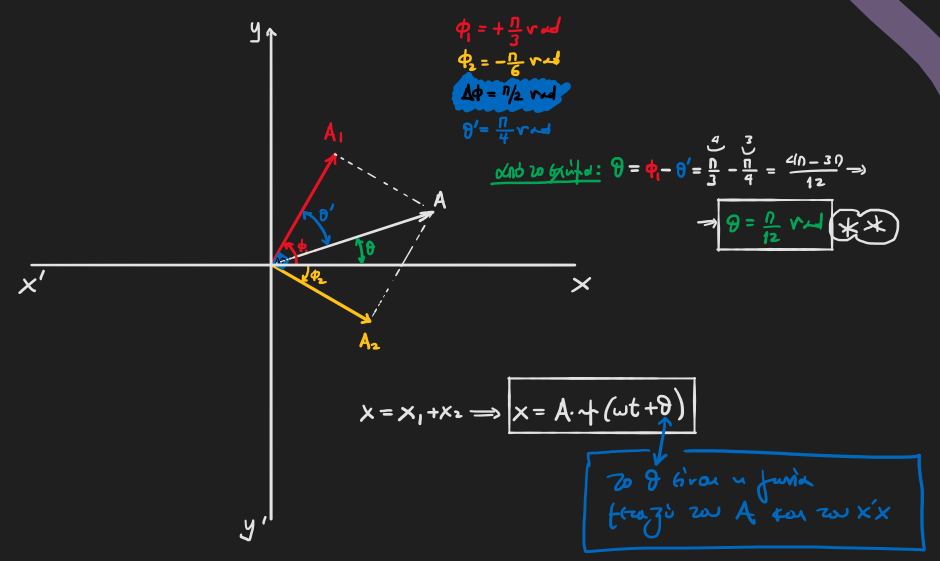
$$\left. \begin{aligned} A_1 &= 2 \text{ m} \\ A_2 &= 2 \text{ m} \\ \omega &= 10 \text{ rad/s} \\ \phi_1 &= \frac{\pi}{3} \\ \phi_2 &= -\frac{\pi}{6} \end{aligned} \right\} \rightarrow \Delta\phi = \phi_1 - \phi_2 = \frac{\pi}{3} - (-\frac{\pi}{6}) \Rightarrow \Delta\phi = \frac{\pi}{2} \text{ rad}$$

tip: φ πορεύεται, να καθορίσει την φάση

$$A = \sqrt{A_1^2 + A_2^2 + 2A_1A_2\cos\Delta\phi} = \sqrt{2^2 + 2^2 + 2 \cdot 2 \cdot 2 \cdot \cos\frac{\pi}{2}} = \sqrt{2 \cdot 2^2} = 2\sqrt{2} \Rightarrow A = 2\sqrt{2} \text{ m} \quad (*)$$

$$\varphi' = \frac{A_2 \cdot \Delta\phi}{(A_1 + A_2) \cdot \cos\frac{\Delta\phi}{2}} = \frac{2 \cdot \frac{\pi}{2}}{(2 + 2) \cdot \cos\frac{\pi}{4}} = \frac{2 \cdot \frac{\pi}{2}}{4 \cdot \frac{\sqrt{2}}{2}} = 1 \Rightarrow \varphi' = \frac{\pi}{4} \text{ rad}$$

φ' : η φάση της συνισταμένης Α ή των Α₁



$$x = x_1 + x_2 \Rightarrow x = A \cdot \psi(\omega t + \varphi')$$

το φ είναι η φάση της συνισταμένης Α και των Α₁

$$(*) \Rightarrow x = A \cdot \psi(\omega t + \varphi) \Rightarrow x = 2\sqrt{2} \cdot \psi(10t + \frac{\pi}{12})$$

2ος Τρόπος

Λύνει μόνο
τις περιπτώσεις
με $A_1 = A_2$

$$\begin{aligned} x_1 &= 2 \cdot \psi(10t + \frac{\pi}{3}) \\ x_2 &= 2 \cdot \psi(10t - \frac{\pi}{6}) \end{aligned}$$

$$\left. \begin{aligned} A_1 &= 2 \text{ m} \\ A_2 &= 2 \text{ m} \\ \omega &= 10 \text{ rad/s} \\ \phi_1 &= \frac{\pi}{3} \\ \phi_2 &= -\frac{\pi}{6} \end{aligned} \right\}$$

Οι χρονικές φάσεις των αρμονικών ταυτίζονται:

$$\psi\alpha + \psi\beta = 2 \cdot \cos\frac{\alpha - \beta}{2} \cdot \psi\frac{\alpha + \beta}{2}$$

! Το κάνω μόνο γιατί $A_1 = A_2$ και μπορεί να έχει κοινά παράγοντες....

$$\begin{aligned} x &= x_1 + x_2 = 2 \cdot \psi(10t + \frac{\pi}{3}) + 2 \cdot \psi(10t - \frac{\pi}{6}) = 2 \cdot \left[\psi(10t + \frac{\pi}{3}) + \psi(10t - \frac{\pi}{6}) \right] = \\ &= 2 \cdot 2 \cdot \cos\frac{(10t + \frac{\pi}{3}) - (10t - \frac{\pi}{6})}{2} \cdot \psi\frac{(10t + \frac{\pi}{3}) + (10t - \frac{\pi}{6})}{2} = \\ &= 4 \cdot \cos\frac{10t + \frac{\pi}{3} - 10t + \frac{\pi}{6}}{2} \cdot \psi\frac{10t + \frac{\pi}{3} + 10t - \frac{\pi}{6}}{2} = \\ &= 4 \cdot \cos\frac{\frac{\pi}{2}}{2} \cdot \psi\frac{20t + \frac{\pi}{6}}{2} = \\ &= 4 \cdot \cos\frac{\pi}{4} \cdot \psi\left(\frac{20t}{2} + \frac{\pi}{12}\right) = 4 \cdot \frac{\sqrt{2}}{2} \cdot \psi(10t + \frac{\pi}{12}) \Rightarrow \\ &\Rightarrow x = 2\sqrt{2} \cdot \psi(10t + \frac{\pi}{12}) \end{aligned}$$