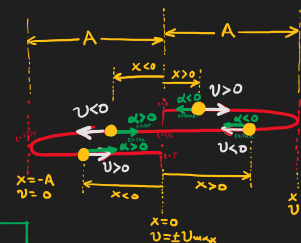


Τρ 1.12.20



	x	v	a
0...T/4	+	+	- ΕΠΙΔΡ.
T/4...T/2	+	-	- ΕΠΙΤΑΧ.
T/2...3T/4	-	-	+ ΕΠΙΔΡ.
3T/4...T	-	+	+ ΕΠΙΤΑΧ.

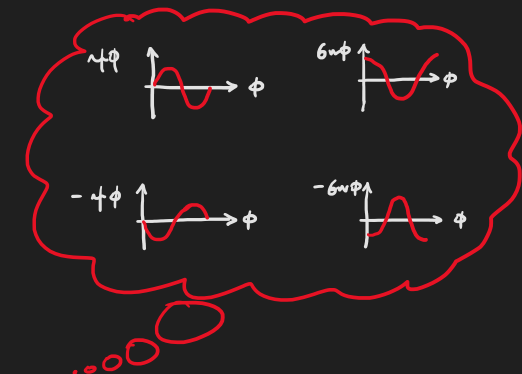
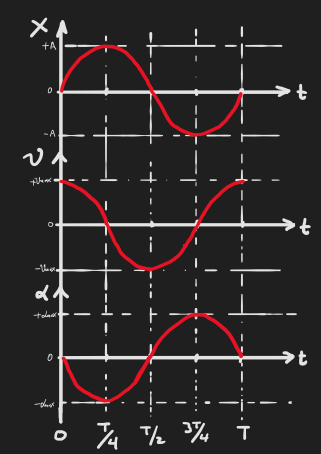
$\vec{a} = \frac{d\vec{v}}{dt}$
 (στην ω) ΕΠΙΤΑΧΥΝΣΗ
 $\vec{a} \uparrow \uparrow \vec{v}, |\vec{v}| \uparrow$ (στην ταχ.)
 $\vec{a} \downarrow \downarrow \vec{v}, |\vec{v}| \downarrow$ (στην βρ.)



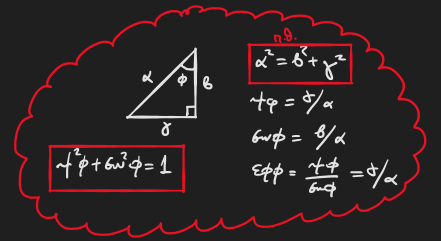
$\Sigma F = F_{\text{elastic}} = -k \cdot x$ $\Rightarrow$ $m \cdot a = -k \cdot x \Rightarrow a = -\frac{k}{m} x$ $\Rightarrow \omega^2 = k/m$
 $\Sigma F = m \cdot a$
 $\Rightarrow a = -\omega^2 x \Rightarrow \frac{dv}{dt} = -\omega^2 x$
 $\Rightarrow \frac{d}{dt} \left(\frac{dx}{dt} \right) = -\omega^2 x \Rightarrow \ddot{x} + \omega^2 x = 0$
 Διωφ. γεν. λύση $\hat{x} = A \cdot \sin(\omega t + \phi)$
 $\hat{x} \rightarrow$ Α.Α.Τ.

ΕΚΤΟΣ ΥΛΗΣ

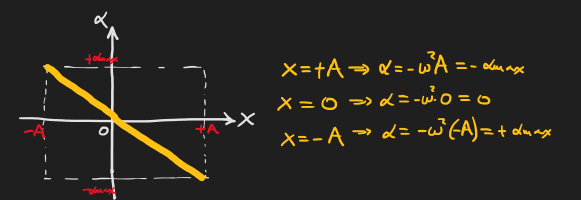
$x = A \cdot \cos \omega t$ $\omega = \frac{2\pi}{T} = 2\pi f$ ($= \sqrt{k/m}$)
 $v = \frac{dx}{dt} = -\omega A \sin \omega t$ $\omega \cdot A = v_{\text{max}} \rightarrow v = v_{\text{max}} \sin \omega t$
 $a = \frac{dv}{dt} = -\omega^2 A \cos \omega t$ $\omega^2 \cdot A = a_{\text{max}} \rightarrow a = -a_{\text{max}} \cos \omega t$



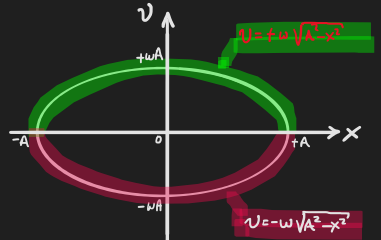
$x = A \cdot \cos \omega t$ ①
 $v = \omega A \cdot \sin \omega t$ ②
 $a = -\omega^2 A \cdot \cos \omega t$ ③



③: $a = -\omega^2 A \cdot \cos \omega t \Rightarrow a = -\omega^2 x$ 9.A.
 $\vec{a} \perp \vec{v}$



①: $\cos \omega t = \frac{x}{A}$
 ②: $\sin \omega t = \frac{v}{\omega A}$
 $\frac{1}{1} \rightarrow + \rightarrow \frac{d}{dt} \left(\frac{x}{A} \right) = \frac{v}{\omega A}$
 $\Rightarrow 1 = \frac{\omega^2 x^2 + v^2}{\omega^2 A^2} \Rightarrow \omega^2 A^2 = \omega^2 x^2 + v^2$
 $\Rightarrow \omega^2 A^2 - \omega^2 x^2 = v^2 \Rightarrow v^2 = \omega^2 (A^2 - x^2)$
 $\Rightarrow v = \pm \omega \sqrt{A^2 - x^2}$ 10.A.



Ασκηση: Σε ΑΑΤ (χωρίς αεροδυναμική φάρα) να βρεθούν:
 πόσο διακυμαίνεται το σώμα (σε εκατόβ. της Α)
 στα χρονικά διαστήματα:
 α) $\Delta t_1 = T$ $\beta)$ $\Delta t_2 = 1,25T$ $\gamma)$ $\Delta t_3 = 25T/12$ $\delta)$ $\Delta t_4 = 7T/3$

α) $\Delta t_1 = T$ $S_{\text{ολ}} = 4A$

β) $\Delta t_2 = 1,25T = T + 0,25T = T + \frac{T}{4}$ $S_{\text{ολ}} = 5A$

γ) $\Delta t_3 = \frac{25}{12}T = \frac{24}{12}T + \frac{1}{12}T = 2T + \frac{1}{12}T$
 $S_{\text{ολ}} = 8A + x$
 $x = A \cdot \cos \omega t = A \cdot \cos \omega \cdot \frac{T}{12} = A \cdot \cos \frac{2\pi}{12} = A \cdot \cos \frac{\pi}{6} = A \cdot \frac{\sqrt{3}}{2}$
 $S_{\text{ολ}} = 8A + 0,5A = 8,5A$

δ) $\Delta t_4 = \frac{7}{3}T = \frac{6}{3}T + \frac{1}{3}T = 2T + \frac{T}{3}$

$\frac{2T}{3} \rightarrow 8A$
 $\frac{T}{3} \rightarrow ?$
 $x = A \cdot \cos \omega t = A \cdot \cos \omega \cdot \frac{T}{3} = A \cdot \cos \frac{2\pi}{3} = A \cdot (-\frac{1}{2}) = -\frac{A}{2}$
 $S_{\text{ολ}} = 8A + A \cdot \frac{\sqrt{3}}{2}$

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