

Σ τ α β γ α υ β γ α τ α

$$Y_1 = A \cos\left(\omega t - \frac{2\pi x}{\lambda}\right)$$

$$Y_2 = A \cos\left(\omega t + \frac{2\pi x}{\lambda}\right)$$

$$\cos\alpha + \cos\beta = 2 \cos\left(\frac{\alpha + \beta}{2}\right) \cos\left(\frac{\alpha - \beta}{2}\right)$$

$$\alpha = \omega t - \frac{2\pi x}{\lambda}$$

$$\beta = \omega t + \frac{2\pi x}{\lambda}$$

$$Y = Y_1 + Y_2 = 2A \cos\left(\frac{\cancel{\omega t - \frac{2\pi x}{\lambda}} - \cancel{\omega t - \frac{2\pi x}{\lambda}}}{2}\right) \cos\left(\frac{\cancel{\omega t - \frac{2\pi x}{\lambda}} + \cancel{\omega t + \frac{2\pi x}{\lambda}}}{2}\right) \Rightarrow$$

$$Y = 2A \cos\left(-\frac{2\pi x}{\lambda}\right) \cos\omega t$$

$$Y = 2A \cos\left(\frac{2\pi x}{\lambda}\right) \cos\omega t$$

$\underbrace{\hspace{10em}}_{A'}$

$$Y = A' \cos\omega t \quad |A'| = 2A \left| \cos\frac{2\pi x}{\lambda} \right|$$

Δεσφοί:

$$|A'| = 0 \Rightarrow \left| \sin \frac{2\pi x}{\lambda} \right| = 0 \Rightarrow$$

$$\frac{2\pi x}{\lambda} = (2k+1) \frac{\pi}{2} \Rightarrow$$

$$x = (2k+1) \frac{\lambda}{4}$$

$$k = 0, 1, 2, \dots$$

Κοιλίες:

$$|A'| = 1 \Rightarrow \left| \sin \frac{2\pi x}{\lambda} \right| = 1 \Rightarrow \sin \frac{2\pi x}{\lambda} = \pm 1 \Rightarrow$$

$$\frac{2\pi x}{\lambda} = k\pi \Rightarrow x = 2k \cdot \frac{\lambda}{4} \quad (k = 0, 1, 2, \dots)$$

Αδ. 2.54

$$y = 8 \sin \frac{\pi x}{2} \sin 10\pi t$$

(x, y σε cm)

$$y = 2A \sin \frac{2\pi x}{\lambda} \sin \omega t$$

$$a) \frac{\pi x}{2} = \frac{2\pi x}{\lambda} \Rightarrow \lambda = 4 \text{ cm}$$

$$\omega = 10\pi \Rightarrow 2\pi f = 10\pi \Rightarrow f = 5 \text{ Hz}$$

$$\text{Αρα: } v = \lambda \cdot f = 20 \text{ cm/sec}$$

β) Το σύγχο μεταφέρει
την ταλάντωση:

$$y_M = 2A \sin \frac{2\pi x_M}{\lambda} \sin \omega t \Rightarrow$$

$$y_M = 2 \cdot 8 \sin \frac{2\pi \cdot 0,5}{4} \sin 10\pi t \Rightarrow$$

$$y_M = 16 \sin \frac{\pi}{4} \sin 10\pi t \Rightarrow$$

$$y_M = 8\sqrt{2} \sin 10\pi t \text{ (σε cm)}$$