㉕ $\longleftarrow 6\,m \longrightarrow$ $f = 60$ Hz

$\longrightarrow 0,5\,s$ $\longrightarrow$ tardan 0,5 s en recorrer los 6 m

¿λ? ¿K?

$$v_p = \frac{e}{t} = \frac{6}{0,5} = 12 \ m/s$$

$$v_p = \lambda \cdot f \to 12 = \lambda \cdot 60 \to \lambda = \frac{12}{60} = \boxed{0,2\ m}$$

$$K = \frac{2\pi}{\lambda} = \frac{2\pi}{0,2} = \boxed{10\pi\ m^{-1}}$$

㉗ ~~Septi~~ 2008

④

$A = 0,1\,m$

$\lambda = 1\,m$

$v_p = 10\ m/s\ (+X)$

$t = 0 \to y = 0$

a) $y = A\,sen(\omega t - Kx + \varphi_0)$

$t = 0 \to y = 0 \to \varphi_0 = 0$

$K = \frac{2\pi}{\lambda} = 2\pi\ m^{-1}$

$v_p = \lambda \cdot f = \lambda \cdot \frac{1}{T} = 10 \to \frac{1}{T} = 10$

$T = \frac{1}{10} = 0,1\,s$ $\quad \omega = \frac{2\pi}{T} = \frac{2\pi}{0,1} = 20\pi$

a)

$$\underline{\underline{Y = 0,1 \cdot sen(20\pi t - 2\pi x)\ m}}$$

NO HACER

b) $\Delta\varphi = \frac{2\pi \cdot \Delta x}{\lambda} = \frac{2\pi \cdot 0,5}{1} = \pi$ rad

$$v = \frac{dy}{dt} = 0,1 \cdot 20\pi \cdot \cos(20\pi t - 2\pi x) \xrightarrow[t=1s]{x=0,1m} \underline{\underline{v = 5,083\ m/s}}$$

㉚ 2009-

(+x) $A = 0{,}2\,m$
$f = 2{,}5\,Hz$
$\lambda = 20\,m$
$Y(0,0) = 0 \rightarrow \varphi_0 = 0$

$$Y(x,t) = A \cdot \text{sen}(\omega t - Kx + \varphi_0)$$

$$\omega = 2\pi f = 2\pi \cdot 2{,}5 = 5\pi \text{ rad/s}$$

$$K = \frac{2\pi}{\lambda} = \frac{2\pi}{20} = 0{,}1\pi \text{ m}^{-1}$$

$$Y = 0{,}2 \cdot \text{sen}(5\pi t - 0{,}1\pi x)$$

㉛
- La amplitud A es independiente del periodo T
- Si cambia la frecuencia f, como $f = \frac{1}{T}$, también cambia el periodo T.
- Si cambia la v_{prop}, como $v_p = \frac{\lambda}{T}$, entonces cambia el T.
- Si cambia la λ, sin cambiar la v_p, cambia el T.

㉜

$$Y(x,t) = 0{,}3 \cdot \cos\left(300\pi t - 10x + \frac{\pi}{2}\right)$$
$$Y = A \cdot \cos(\omega t - Kx + \varphi_0)$$

$\varphi_0 = \frac{\pi}{2}$
$\omega = 300\pi$
$K = 10$

$$\omega = 300\pi \rightarrow 2\pi f = 300\pi \rightarrow f = \frac{300\pi}{2\pi} = \boxed{150\ Hz}$$

$$K = 10 \rightarrow \frac{2\pi}{\lambda} = 10 \rightarrow \lambda = \frac{2\pi}{10} = \boxed{\frac{\pi}{5}\ m}$$

2010-fm-sept-A. (RARO) ③

㉟ 2 focos sonoros → ondas armónicas planas { misma A, en fase, $f = 10^3$ Hz

a) ¿K? ¿λ? T → onda resultante interferencia $v = 340$ m/s.

$$Y = Y_1 + Y_2 \begin{cases} Y_1 = A\cdot sen(\omega t - K\cdot x_1) \\ Y_2 = A\cdot sen(\omega t - K\cdot x_2) \end{cases}$$

misma ω, K.

$$Y = 2A\cdot sen\,\frac{\cancel{\omega t}-K\cdot x_1+\cancel{\omega t}-K\cdot x_2}{2}\cdot cos\,\frac{\cancel{\omega t}-K\cdot x_1-\cancel{\omega t}+Kx_2}{2}$$

$$= \underbrace{\boxed{2A}\, sen\left(\frac{2\omega t-K(x_1+x_2)}{2}\right)\boxed{cos\,\frac{K(x_2-x_1)}{2}}}\to \underline{\underline{cte}}$$

misma K, misma λ, misma T

$$= A'\cdot sen\left[\omega t-\frac{K}{2}(x_1+x_2)\right]$$

No lo dejaré hecho.

㊱ 2010-sept-B- $y(x,t) = 0{,}02\cdot sen\left[10\pi(x-2t)+0{,}52\right]$

¿A? λ, f, $v_{prop.}$ φ_0. $\boxed{A = 0{,}02\,m}$ $\boxed{\varphi_0 = 0{,}52\,rad}$

$Y = A\cdot sen(\omega t - Kx + \varphi_0)$.

$\omega = -10\pi\cdot 2 \to 20\pi$

$K = -10\pi \to 10\pi$

$20\pi = 2\pi f \to \boxed{f = 10\,Hz}$

$K = \frac{2\pi}{\lambda} \to 10\pi\cdot\lambda = 2\pi \to \boxed{\lambda = 0{,}2\,m}$

$v_{prop} = \lambda\cdot f = 0{,}2\cdot 10 = \boxed{2\,m/s}$

2011-jun-B.

(38) Refracción → al cambiar el medio se forma una onda que se propaga → onda refractada

misma frecuencia (sólo depende del foco emisor)

la v de propagación cambia

como $v = \lambda \cdot f \to \lambda$ cambia

$v_2 = 2v_1 \to \lambda_2 \cdot f = 2 \cdot \lambda_1 \cdot f \to \boxed{\lambda_2 = 2\lambda_1}$

la A de la onda refractada siempre AUMENTA (con la v)

Teoría: Difracción y refracción de ondas.

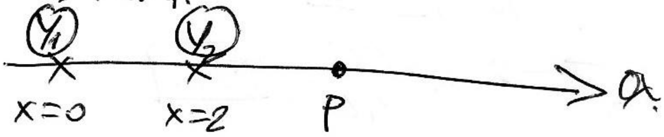
2012-jun-A.

(41) 2 ondas armónicas transv. Fuente $\begin{cases} x = 0 \text{ m} \\ x = 2 \text{ m} \end{cases}$; $\dfrac{v = 8 \text{ m/s}}{OX}$ $A = 1 \text{ cm} = 0{,}01 \text{ m}$

$f = 0{,}5 \text{ Hz}$

la de $x=2 \to$ dif. de fase $+\pi/4$ con respecto a la de $x=0$.

a) Ec. de ondas result.



Y_1 $Y = A \cdot sen(\omega t - Kx)$

$\boxed{Y_1 = 0{,}01 \cdot sen\left(\pi t - \frac{\pi}{8} x\right)}$

$\boxed{Y_2 = 0{,}01 \cdot sen\left(\pi t - \frac{\pi}{8} x + \frac{\pi}{4}\right)}$

$A = 0{,}01 \text{ m}$

$\omega = 2\pi f = 2\pi \cdot 0{,}5 = \pi \text{ rad/s}$

$v = \lambda \cdot f \to \lambda = \frac{v}{f} = \frac{8}{0{,}5} = 16 \text{ m}$

$K = \frac{2\pi}{\lambda} = \frac{2\pi}{16} = \frac{\pi}{8} \text{ m}^{-1}$

$$y_1 + y_2 = 0{,}01\cdot \text{sen}\left(\underbrace{\pi t - \frac{\pi}{8}x}_{\alpha}\right) + 0{,}01\cdot \text{sen}\left(\underbrace{\pi t - \frac{\pi}{8}x + \frac{\pi}{4}}_{\beta}\right)$$ ②

$$\text{sen}\,\alpha + \text{sen}\,\beta = 2\cdot \text{sen}\,\frac{\alpha+\beta}{2}\cdot \cos\frac{\alpha-\beta}{2}$$

$$y_1 + y_2 = 0{,}01\left[\text{sen}\,\alpha + \text{sen}\,\beta\right] = 0{,}01\cdot 2\cdot \text{sen}\,\frac{\pi t - \frac{\pi}{8}x + \pi t - \frac{\pi}{8}x + \frac{\pi}{4}}{2}\cdot$$

$$\cdot \cos\frac{\pi t - \frac{\pi}{8}x - \pi t + \frac{\pi}{8}x - \frac{\pi}{4}}{2} =$$

$$= 0{,}01\cdot 2\ \text{sen}\,\frac{2\pi t - \frac{2\pi}{8}x + \frac{\pi\cdot\cancel{2}}{4\cdot 2}}{2}\cdot \cos\frac{-\frac{\pi}{4}}{2} =$$

$$= 0{,}02\cdot \text{sen}\left(\frac{2\pi t - \frac{2\pi}{8}x + \frac{2\pi}{8}}{2}\right)\cdot \cos\left(\frac{\pi}{8}\right) =$$

$$= 0{,}02\cdot \text{sen}\left(\pi t - \frac{\pi}{8}x + \frac{\pi}{8}\right)\cdot \cos\left(\frac{\pi}{8}\right)$$ misma f y A.

2013-Julio-A.

(47) transversal $y(x,t) = 0{,}4\cdot\cos[10\pi(2t-x)]$

a) $\left.\begin{array}{l} x = 20\ \text{cm} = 0{,}2\ \text{m} \\ t = 0{,}5\ \text{s} \end{array}\right\}$ $y = 0{,}4\cdot\cos[10\pi(2\cdot 0{,}5 - 0{,}2)] = \boxed{0{,}4\ \text{m}}$.

b) $v = \dfrac{dy}{dt} = -0{,}4\cdot 10\pi\cdot 2\cdot \text{sen}[10\pi(2t-x)] =$

$= -8\pi\ \text{sen}[10\pi(2t-x)]$ $\left\{\begin{array}{l} x = 0{,}2\ \text{m} \\ t = 0{,}5\ \text{s} \end{array}\right\}$ ~~$v = -8\pi$ m/s~~

$v = -8\pi\cdot \text{sen}(7\pi) = \boxed{0\ \text{m/s}}$.

2014-Junio-B.

(50) $Y(x,t) = 2\,\mathrm{sen}\left(\frac{\pi}{5}t - 2{,}2x\right)$ ¿A? ¿T? ¿f? ¿λ?

a) $Y = A\cdot \mathrm{sen}(\omega t - Kx)$ $\boxed{A = 2\,m}$

$$\omega = \frac{\pi}{5} = \frac{2\pi}{T} \rightarrow \boxed{T = 10\,s}$$

$$f = \frac{1}{T} = \frac{1}{10} = \boxed{0{,}1\,Hz}$$

$$K = 2{,}2 = \frac{2\pi}{\lambda} \rightarrow \lambda = \frac{2\pi}{2{,}2} = \boxed{2{,}86\,m}$$

b) ¿v? $x = 2\,m$ ¿t? $v = 0$.
$t = 10\,s$

$v_{propagaci} = \lambda\cdot f = 2{,}86\cdot 0{,}1 = 0{,}286\ m/s$

$$v_{vibraci} = \frac{dy}{dt} = 2\cdot\frac{\pi}{5}\cdot\cos\left(\frac{\pi}{5}t - 2{,}2x\right) = \boxed{-0{,}386\ m/s}$$

$$v = 0 \rightarrow 0 = \cos\left(\frac{\pi}{5}\cdot t - 2{,}2\cdot 2\right) \rightarrow \boxed{t = 9{,}5\,s}$$

F2B.

(52) 20~~14~~-Julio-B ①

$Y = 2\,\mathrm{sen}[2\pi(t - x)]\ cm$ ¿T? ¿f? ¿λ? ¿K?

a) $$\left.\begin{array}{l} y = 2\,\mathrm{sen}[2\pi t - 2\pi x] \\ y = A\cdot\mathrm{sen}[\omega t - Kx] \end{array}\right\} \begin{array}{l} \omega = 2\pi \\ \boxed{K = 2\pi\ cm^{-1}} \end{array} \quad \omega = \frac{2\pi}{T} \rightarrow 2\pi = \frac{2\pi}{T} \rightarrow \boxed{T = 1\,s}$$

$$f = \frac{1}{T} = \boxed{1\,Hz}$$

$$K = 2\pi\frac{1}{cm}\cdot\frac{100\,cm}{1\,m} = \boxed{200\pi\ m^{-1}}$$

$$K = \frac{2\pi}{\lambda} \rightarrow 2\pi = \frac{2\pi}{\lambda} \rightarrow \lambda = 1\,cm = \boxed{0{,}01\,m}$$

b) $$v_{prop.} = \frac{\lambda}{T} = \lambda\cdot f = 0{,}01\cdot 1 = \boxed{0{,}01\ m/s}$$

$$v_{vibrac.} = \frac{dy}{dt} = 2\cdot 2\pi\cdot\cos(2\pi t - 2\pi x) \left\{\begin{array}{l} t = 10\,s \\ x = 10\,cm \end{array}\right\} v = 4\pi\cdot\cos(2\pi\cdot 10 - 2\pi\cdot 10) =$$

$$= 4\pi\ cm/s = \boxed{0{,}04\pi\ m/s}$$