QUIZ 2
Spring 2005
3:30 Section Thursday Quiz
8:30 recitation
Frank De Lucia

Two sinusoidal waves, identical except for phas, travel in the same direction along a string and interfere to produce a resultant wave given by

$y'(x,t) = (3.0\text{ mm}) \sin(20x - 4.0t + 0.820\text{ rad})$

What are:

(a) The wavelength λ of the two waves?

$k = \frac{2\pi}{\lambda}$ $\quad \lambda = \frac{2\pi}{k}$

$k = 20$ $\quad \lambda = \frac{2\pi}{20} = \frac{\pi}{10} =$ 0.31416 m ✓

(b)The phase difference between them?

$\frac{1}{2}\phi = 0.820$

$\phi = 1.640$ radians ✓

(c) Their amplitude?

$A\left(\sin\left(\frac{\pi}{2} - 0.82\right) + \sin\left(\frac{\pi}{2} + 0.82\right)\right) = 3$

$2A\cos(0.82) = 3$

$A = 2.20$

EACH INDIVIDUAL AMPLITUDE IS 2.20 MM
COMBINED, THEIR AMPLITUDE IS 3.00 MM ✓

KEY

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2:30 recitation Thursday Quiz
Frank De Lucia

A string oscillates according to the equation

$$y' = (0.50cm)\sin\left[\left(\frac{\pi}{3}cm^{-1}\right)x\right]\cos\left[\left(40\pi s^{-1}\right)t\right]$$

(a) What is the amplitude of the two waves (identical except for the direction of travel) whose superposition gives this oscillation?

$y' = 2y_m \sin kx \cos\omega t$

$2y_m = 0.50\,cm$

$y_m = 0.25\,cm$

(b) What is the speed of the two waves (identical except for the direction of travel) whose superposition gives this oscillation?

$$v = \frac{\omega}{k} = \frac{4\pi}{\pi/3} = 12\,\frac{cm}{s}$$

(c) What is the wavelength of the two waves?

$$\lambda = \frac{2\pi}{k} = \frac{2\pi}{\pi/3} = 6\,cm$$