

Chapter 16Problem 92

$$y_1(x,t) = 0.3 \sin(4x - 3t)$$

$$y_2(x,t) = 0.3 \sin(4x + 3t)$$

for now I
dropped the
units

what is $y_1 + y_2$?

We know that $\sin(u+v) = \sin u \cos v + \cos u \sin v$
and $\sin(u-v) = \sin u \cos v - \cos u \sin v$

add these together

$$\begin{aligned} \sin(u+v) + \sin(u-v) &= \sin u \cos v + \cos u \sin v \\ &\quad + \sin u \cos v - \cos u \sin v \\ &= 2 \sin u \cos v \end{aligned}$$

$$\text{now } u = 4x$$

$$v = 3t$$

Then

$$y_1 + y_2 = 0.3 [\sin(4x - 3t) + \sin(4x + 3t)]$$

$$= 0.3 [2 \sin(4x) \cos(3t)]$$

$$= 0.6 \sin(4x) \cos(3t)$$

$$y_1 + y_2 = (0.6 \text{ m}) \sin(4 \text{ m}^{-1}x) \cos(3 \text{ s}^{-1}t)$$