Problem 1.1 A 2-kHz sound wave traveling in the $x$-direction in air was observed to have a differential pressure $p(x, t) = 10 \text{ N/m}^2$ at $x = 0$ and $t = 50 \text{ ms}$. If the reference phase of $p(x, t)$ is $36^\circ$, find a complete expression for $p(x, t)$. The velocity of sound in air is $330 \text{ m/s}$.

Problem 1.6 The height of an ocean wave is described by the function

$$y(x, t) = 1.5 \sin(0.5t - 0.6x) \text{ (m)}.$$

Determine the phase velocity and wavelength, and then sketch $y(x, t)$ at $t = 2 \text{ s}$ over the range from $x = 0$ to $x = 2\lambda$.

Problem 1.8 Two waves on a string are given by the following functions:

\begin{align*}
y_1 (x, t) &= 4\cos(20t - 30x) \text{ (cm)} \\
y_2 (x, t) &= -4\cos(20t + 30x) \text{ (cm)}
\end{align*}

where $x$ is in centimeters. The waves are said to interfere constructively when their superposition $|y_s| = |y_1| + |y_2|$ is a maximum, and they interfere destructively when $|y_s|$ is a minimum.

(a) What are the directions of propagation of waves $y_1 (x, t)$ and $y_2 (x, t)$?

(b) At $t = (\pi/50) \text{ s}$, at what location $x$ do the two waves interfere constructively, and what is the corresponding value of $|y_s|$?

(c) At $t = (\pi /50) \text{ s}$, at what location $x$ do the two waves interfere destructively, and what is the corresponding value of $|y_s|$?