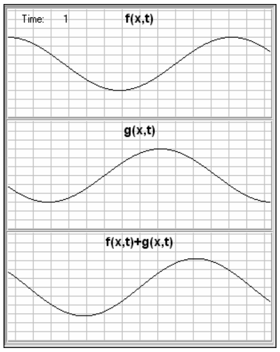
# *Worksheet for Exploration 17.5: Superposition of Two Waves*




The top two windows display waves that are traveling simultaneously in the same nondispersive medium: string, spring, air column, etc. (**position is given in meters and time is given in seconds**). Restart. Note that the two waves are traveling at the same speed in opposite directions and that they have the same amplitude and wavelength. It is, of course, possible that the two waves could have different amplitudes and wavelengths. However, the waves that we are studying must have the same speed.

The wave in the bottom window is the *superposition* (algebraic sum) of the two *component* waves in the upper windows. The superposition is what you would actually see. You wouldn't see the component waves.

a. Why must the two waves have the same speed? (Think in terms of what influences wave speed in the medium.)

b. Stop the top wave and measure its wavelength in units of divisions along the horizontal axis. Sketch the wave, showing the two points between which you measured the wavelength.

$\lambda$=________

Sketch:

c. Now measure the period of the top wave in time units. Describe your method for doing this.

T=________

d. Calculate the speed of the top wave. Show your work.

v=________

e. Assume that the bottom wave shown represents the displacement of a string. What is the longitudinal speed of a point on the string?

f. Assume that the bottom wave shown represents the displacement of a string. Is there a time when the transverse speed of the string is zero?

g. What relationship, if any, do the speeds in (d), (e), and (f) have to one another?