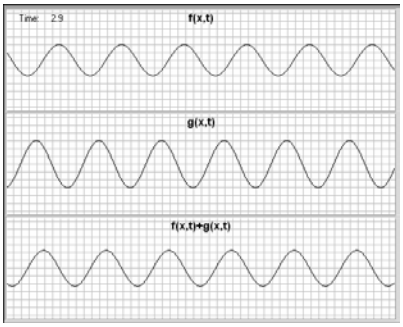
Worksheet for Exploration 17.4: Superposition of Two Waves



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**). 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. Restart. You can adjust the amplitude, wavelength, and wave speed for g (x, t) (the middle window). For the waves described (traveling in the same medium), the two waves could have different amplitudes and wavelengths, but they must have the same speed (you will need to adjust the wave speed of g (x, t) appropriately).

a. Why must the two waves have the same speed? (Think in terms of what influences wave speed in the medium.)
   i. Note that in general different wavelengths can have different speeds. The question here means that "in order to give a constant superposition waveform " the speeds must be the same (and direction).

b. For each f (x, t) determine the amplitude, wavelength, frequency, and wave speed of the wave. Check your answer by making g (x, t) identical to f (x, t).

f(x,t) = 3*cos[2*pi(x/8-t/4)]

A=_____

λ=_____

f=_____

f(x,t) = 3*cos[2*pi(x/2-t/2)]

A=_____

λ=_____

f=_____

c. Determine the amplitude, wavelength, and wave speed of the wave, g (x, t), that will make f + g a standing wave.
   i. Do this for each of the waveforms f.