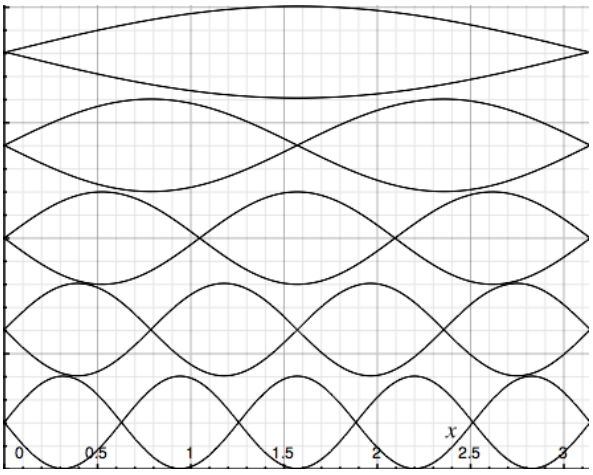
12.3) We have an open tube, so the frequencies will be given by  where *n* can be any positive integer (1, 2, 3, ...). The question asks for fundamental mode, so  . We are given the length of the pipe  . Since this is a pipe, the speed we want is the speed of sound in air. Since we aren't given a temperature, use  .

12.4) We have an open tube, so the frequencies will be given by  where *n* can be any odd integer (1, 3, 5, 7, ...). The question asks for fundamental mode, so  . We are given the length of the pipe  . Since this is a pipe, the speed we want is the speed of sound in air. Since we aren't given a temperature, use $L=0.57\text{m}$.

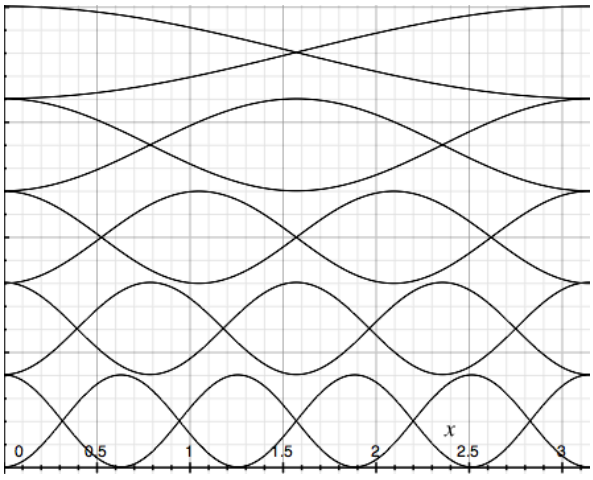
12.5) We have an open tube, so the frequencies will be given by  where *n* can be any positive integer (1, 2, 3, ...). We can get wavelength either from the sketches, from the frequencies through  or from  .

1st mode 5th mode

pressure for the first 5 modes



displacement for first 5 modes



12.6) We have a closed tube, so the frequencies will be given by  where *n* can be any odd integer (1, 3, 5, ...). We can get wavelength either from the sketches, from the frequencies through  or from  .

1st mode 5th mode - 5th possible mode so the 5th odd number or (2*5-1)=9


pressure for 5th mode – open on left

displacement for 5th mode – open on left

12.7) This is the reverse process of the previous several problems and a direct comparison of stopped and open pipes.

stopped

open

12.20)

13.6) The equation for frequency in an ideal closed cylinder (reeds are closed and the clarinet is a cylinder) is  where *n* must be an odd integer.

The lowest note of an instrument (with the notable exception of the brass) is the fundamental, so n=1.

The instrument has a bell at the end which lessens its effective length of the instrument.

13.8)