Google "Physlet Physics"
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WORKS BEST in FIREFOX

I17.1 Chapter 17 from drop down menu
"I" means Illustration
"1" is the number of the illustration

I17.3

E17.1

I17.4 Node, Antinode || Standing waves

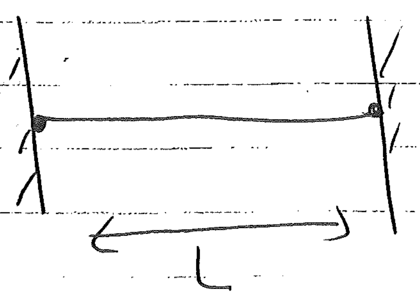
E17.3 Barriers

I17.5

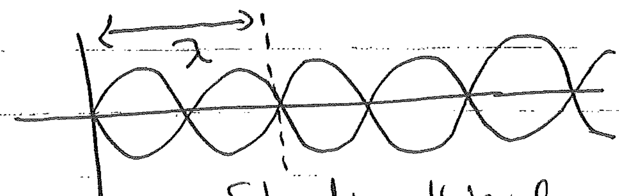
I17.6 Resonance, Boundary Conditions
Standing waves

Standing waves and Boundary Conditions (B.C)

Consider a string fastened @ both ends



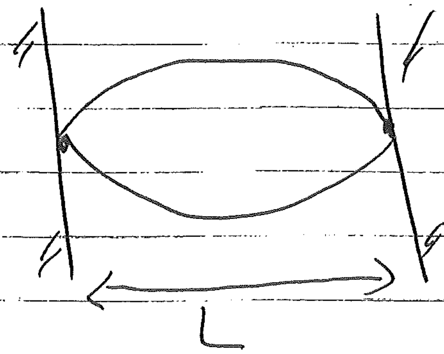
Find the resonant frequencies if the waves travel w/ speed v



Standing Wave

"Fundamental frequency"
lowest, simplest pattern that matches B.C.'s

1st Harmonic



$L = \frac{\lambda}{2}$

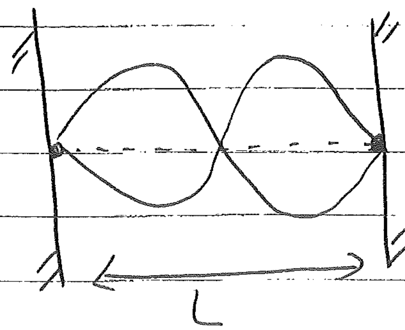
$\therefore \lambda = 2L$

$\lambda f = v$

$\therefore f_1 = \frac{v}{\lambda} = \frac{v}{2L}$

subscript of "1"

Fundamental Frequency



$L = \lambda$

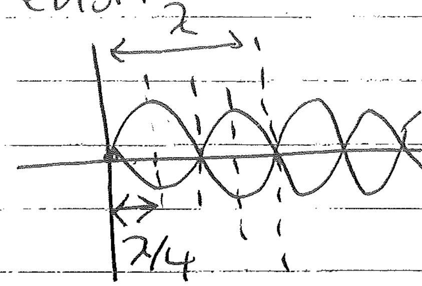
$\lambda f = v$

$f_2 = \frac{v}{\lambda} = \frac{v}{L} = 2f_1$

☺ ☺

"2nd Harmonic"

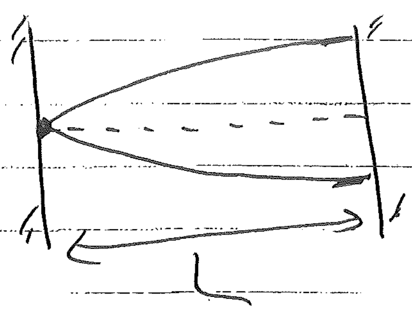
Consider a string fastened @ one end.
Find the resonant frequencies.

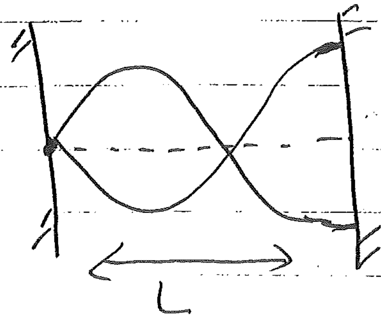


$L = \lambda/4$

$\therefore \lambda = 4L$

$f_1 = \frac{v}{\lambda} = \frac{v}{4L}$





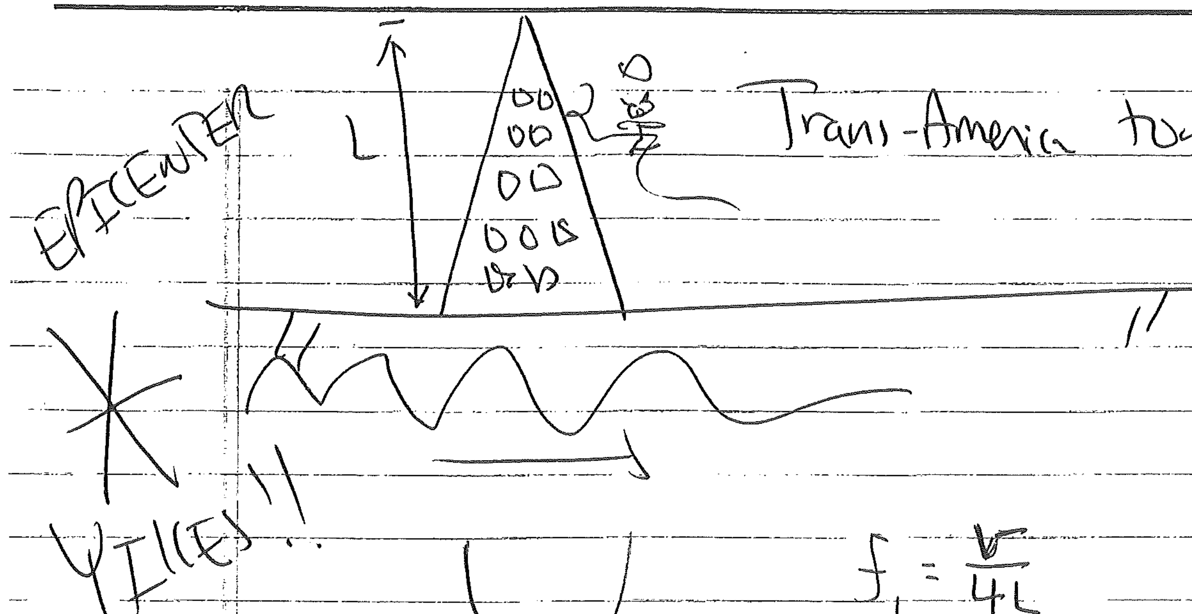
$L = \frac{3\lambda}{4}$

$\therefore \lambda = \frac{4L}{3}$

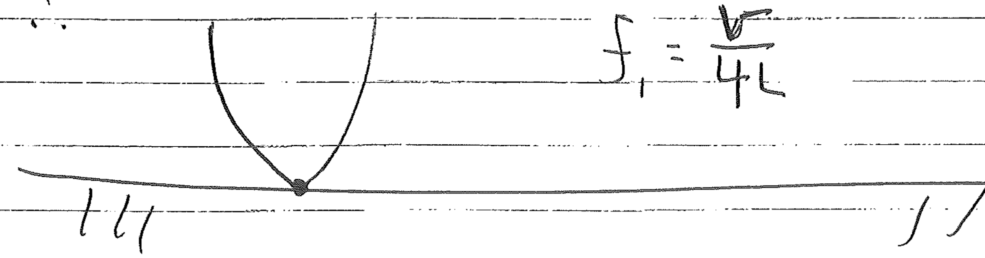
$f_3 = \frac{v}{\lambda} = \frac{3v}{4L} = 3f_1$

☺ harmonic

Hmmm...



Trans-America tower in S.F.



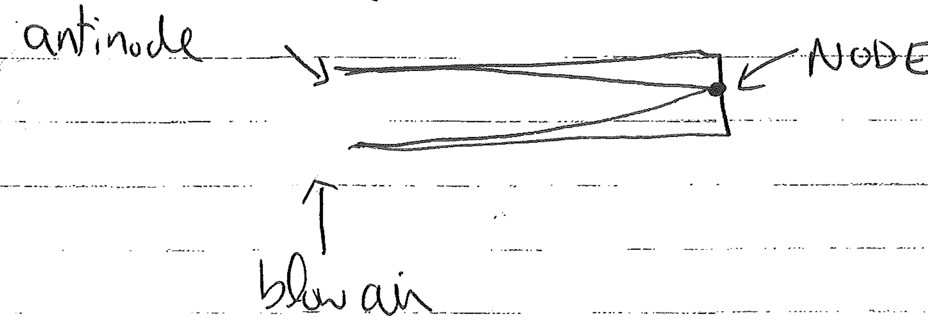
$f_1 = \frac{v}{4L}$

All waves can form Standing waves

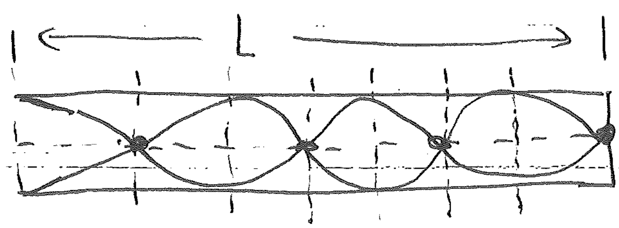
All structures resonate.

I 18.2

Standing waves (Sound) in an air column



P.18.14

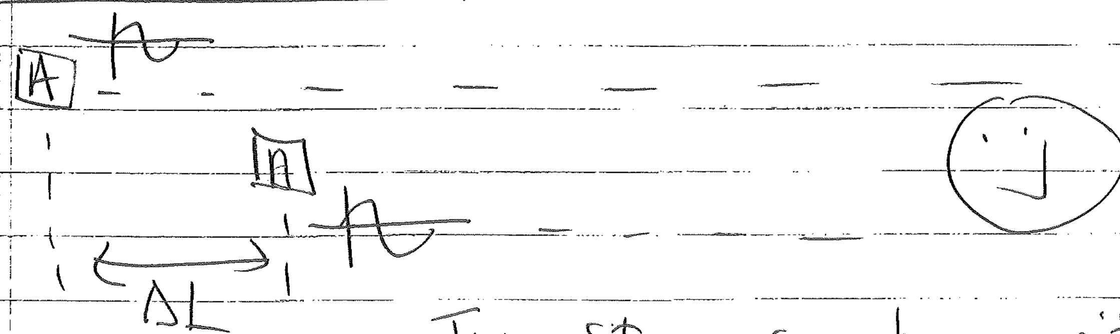


Already seen $f_1 = \frac{v}{4L}$

here, we have $L = 7\frac{\lambda}{4}$ | $f = \frac{v}{\lambda} = 7\frac{v}{4L} = 7f_1$

$\therefore \lambda = \frac{4L}{7}$

7th harmonic



Two Stereo speakers emit identical 1000 Hz waves.

What is their minimum separation that produces a minimum in the sound heard by the observer?