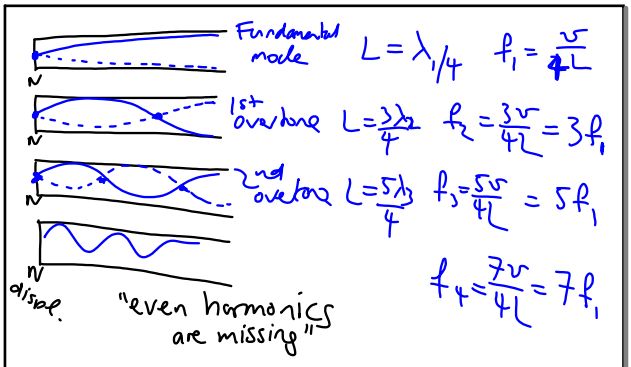
Lec 10 – standing sound waves (cont.)
- properties of sound
- loudness of sound (decibel scale)
- interference

May 8-1:57 PM

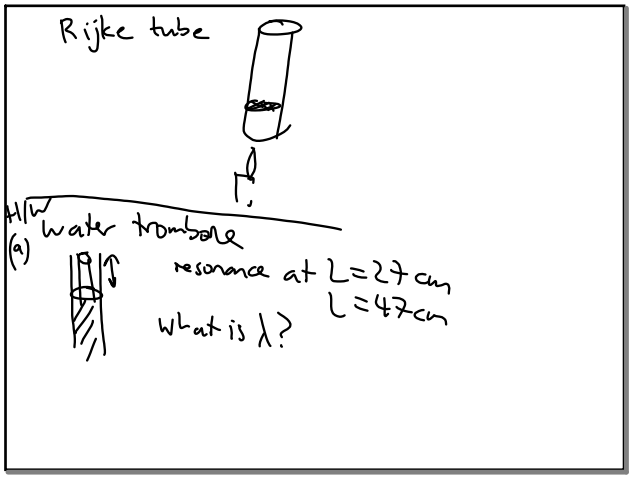
Standing Sound Waves

① pipe open at both ends (flute, recorder, organ pipe)
② half-open pipe (trumpet, clarinet, etc)

May 8-2:04 PM



May 8-2:08 PM



May 8-2:21 PM

(b) where does the extra energy come from?

Properties of sound

frequency ⇒ pitch
amplitude ⇒ loudness
mixture of overtones ⇒ tone, timbre

May 8-2:29 PM

Loudness – Intensity

We can hear an enormous range of intensity of sound
⇒ Useful to use logarithm units.

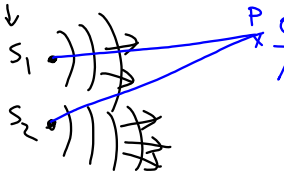
β = intensity measured in decibels $\stackrel{\text{def}}{=} 10 \log_{10}\left(\frac{I}{I_0}\right)$

May 8-2:34 PM

Interference

- Superposition of waves from two or more different sources.

identical



loud – constructive interference when

$|S_1P - S_2P| = m\lambda$

Path difference

May 8-2:40 PM

- similarly, get destructive interference when

$|S_1P - S_2P| = \frac{\lambda}{2}, \frac{3\lambda}{2}, \frac{5\lambda}{2}, \ldots$

$= \left(m + \frac{1}{2}\right)\lambda$

$m = 0, 1, 2, 3, \ldots$

May 8-2:53 PM

where I is intensity in $W\,m^{-2}$ (power per unit area)

I_0 is a reference value

$10^{-12}\ W\,m^{-2}$

approx softest audible sound.

May 8-2:36 PM