

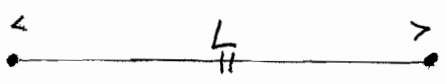
Standing waves

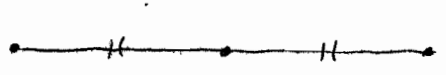
(1) (1)

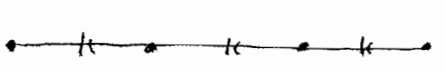
Giancoli 6.ed: 11-13, 12-4

[You are not supposed to know details about formulas with tension F_T of a string, but can just use them].

Nodes in both ends: (closed)


 $n=1 \quad L = \frac{1}{2} \lambda$


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


 $n=3 \quad L = \frac{3}{2} \lambda$


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

$$\lambda f = v$$

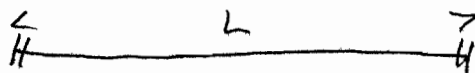
$$f = \frac{v}{2L}$$

$$f = \frac{v}{L} = 2 \frac{v}{2L}$$

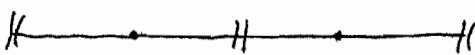
$$f = 3 \frac{v}{2L}$$

$$f = n \frac{v}{2L}$$

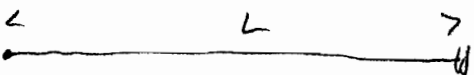
Antinodes in both ends: (open)

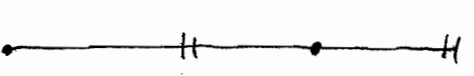


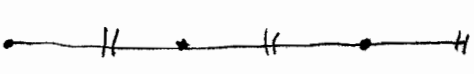
Same formulas as above.



Node + antinode in ends: (half-open)


 $n=1 \quad L = \frac{1}{4} \lambda$


 $n=2 \quad L = \frac{3}{4} \lambda$


 $n=3 \quad L = \frac{5}{4} \lambda$


 $n \quad L = \frac{2n-1}{4} \lambda$

$$\lambda f = v$$

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

$$f = \frac{3v}{4L}$$

$$f = \frac{5v}{4L}$$

$$f = (2n-1) \frac{v}{4L}$$

- As applied on strings and organ pipes.

For sound in air:

molecular displacement	pressure
node	anti-node
anti-node	node