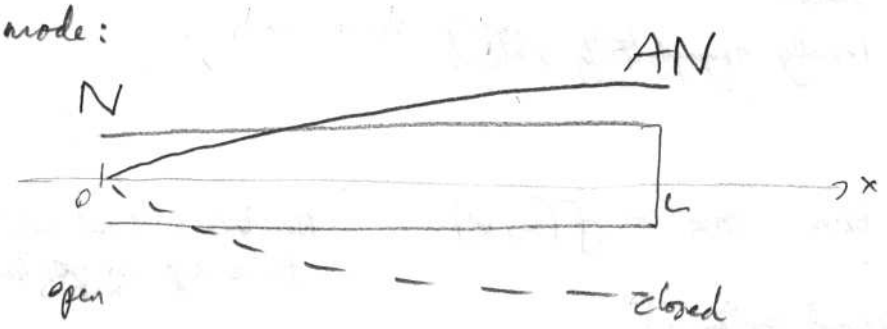
MATH 5 WORKSHEET : Pipe mode frequencies

Barnett 5/4/07

If one end open, other closed ('open-closed' pipe), get

(pressure) { Node at open end
           { Anti Node at closed end.

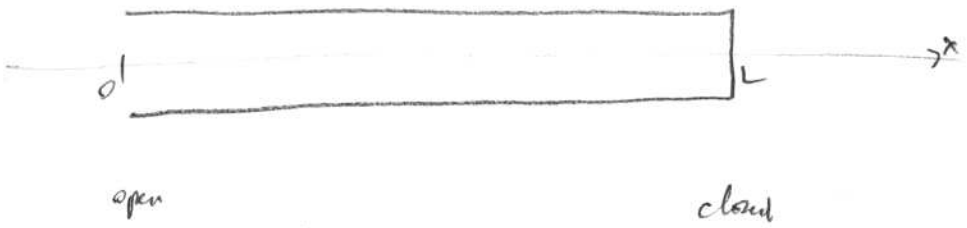
1st mode:



I've drawn mode shape. What fraction of a wavelength λ is L?

So what is frequency f_1? (in terms of L, c)

2nd mode.: draw the next mode that matches the boundary conditions, labelling N, AN locations.



What fraction of λ is L?

So what is the freq.?

What is general rule for frequencies (mode n)?

Which <u>harmonics</u> of fundamental are present?

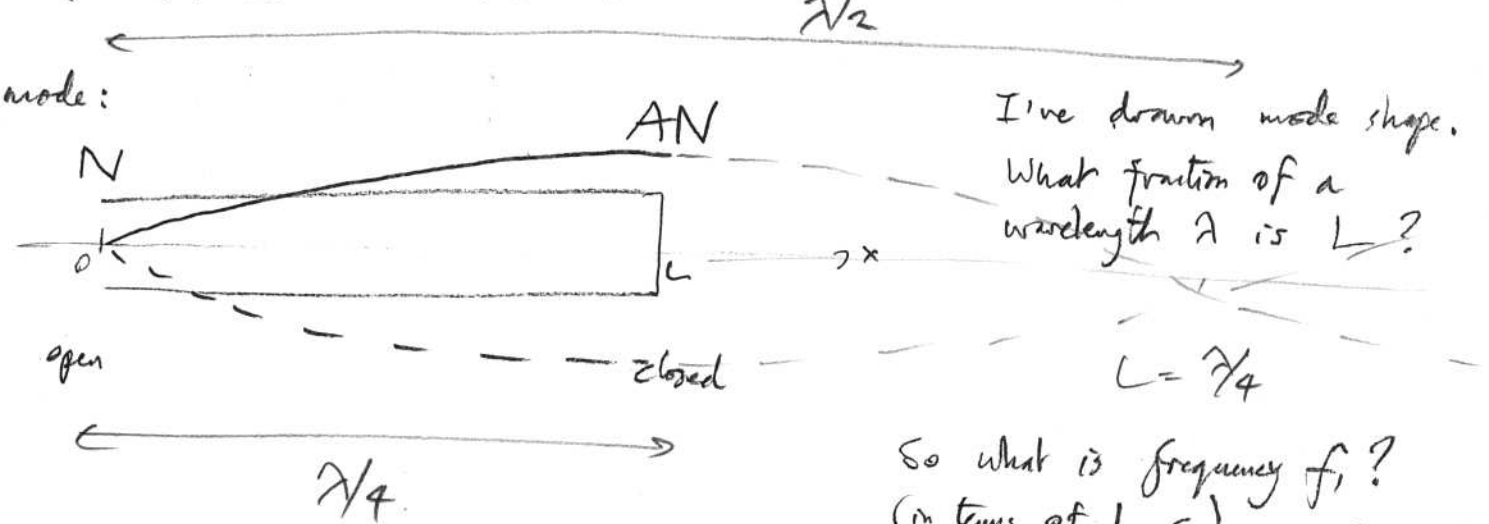
MATH 5 WORKSHEET : Pipe mode frequencies

Barnett 5/4/07

If one end open, other closed ('open-closed' pipe), get

(pressure) { Node at open end
{ Anti Node at closed end.

1st mode:



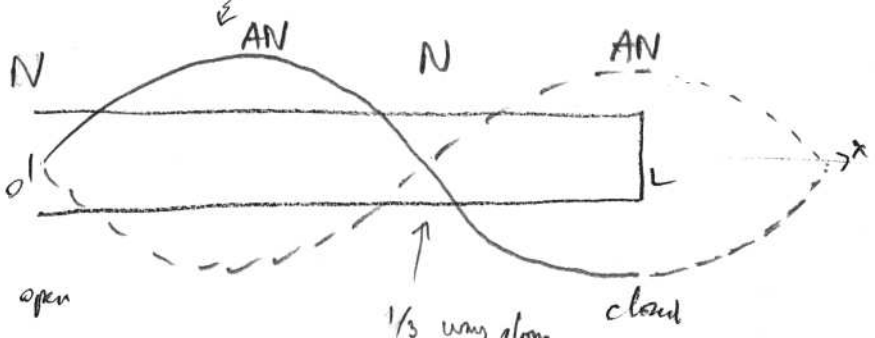
I've drawn mode shape.
What fraction of a wavelength λ is L?

$L = \lambda/4$

So what is frequency f_1? (in terms of L, c)

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

2nd mode.: draw the next mode that matches the boundary conditions, labelling N, AN locations.



1/3 way along from closed end (it's where to put a register key in a clarinet)

What fraction of λ is L?

3/4, ie $\lambda = \frac{4}{3}L$

So what is the freq.? $f_2 = \frac{c}{4/3 L} = 3\frac{c}{4L}$.

What is general rule for frequencies (mode n)?

$f_n = (2n-1)\frac{c}{4L}$

Which <u>harmonics</u> of fundamental are present? 1, 3, 5, ... just odd.