Phys 2110-3 12/3/10

Note Title 12/3/2010

$$\beta = 10 \log_{10}\left(\frac{I}{I_0}\right) \qquad I_0 = 10^{-12}\ \frac{W}{m^2}$$

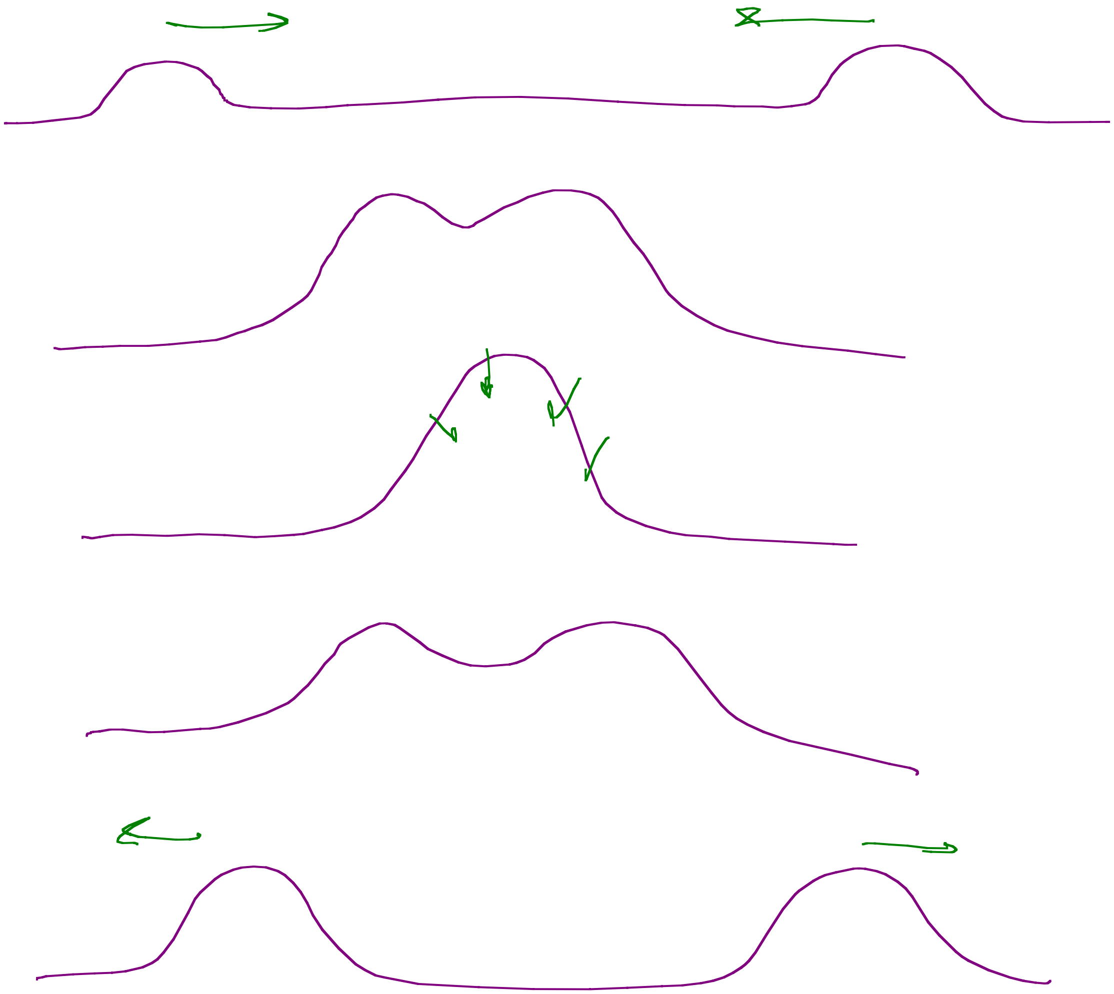
decibels

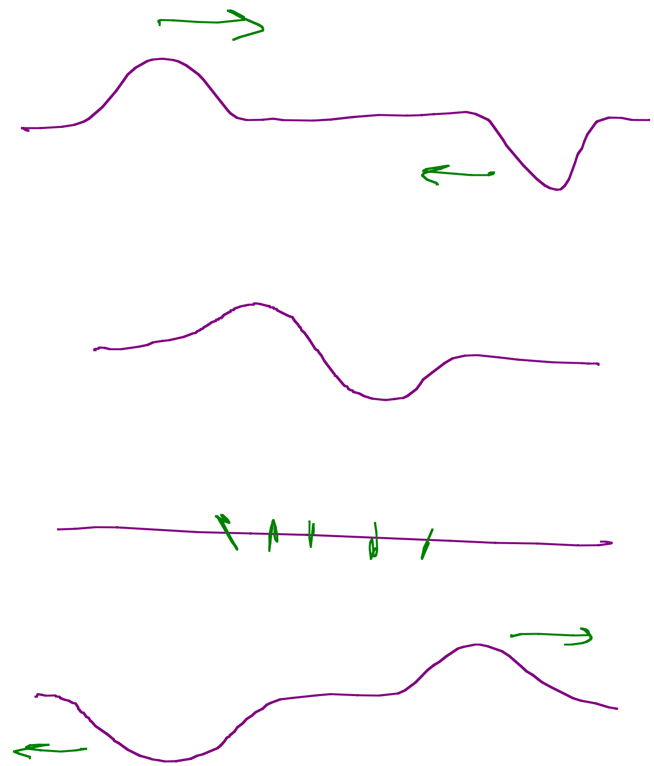
Interesting stuff:

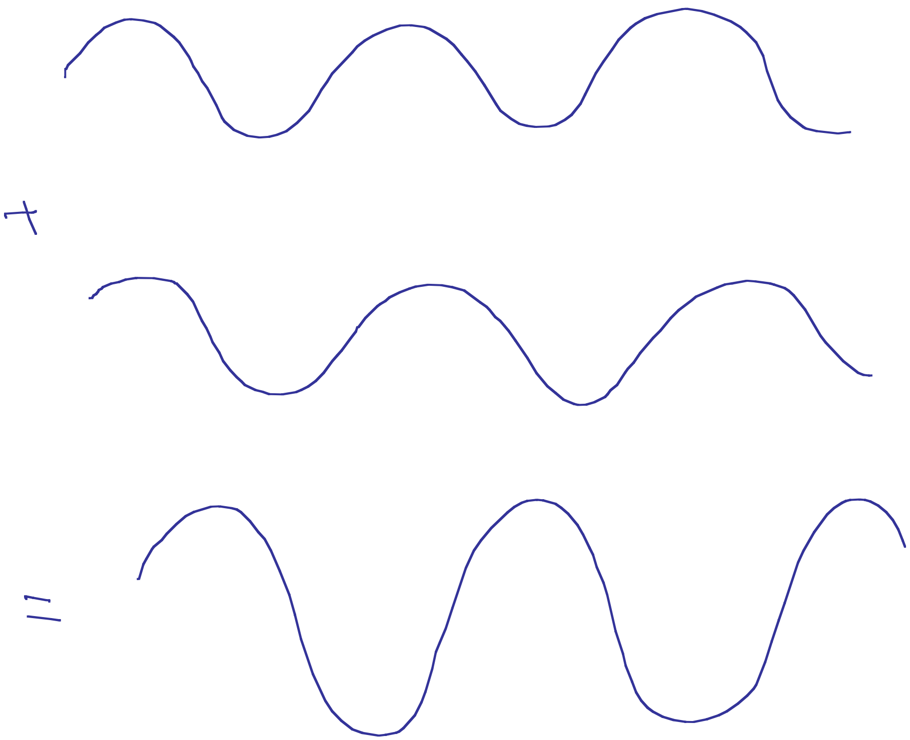
Waves combine, add together

Superposition Principle

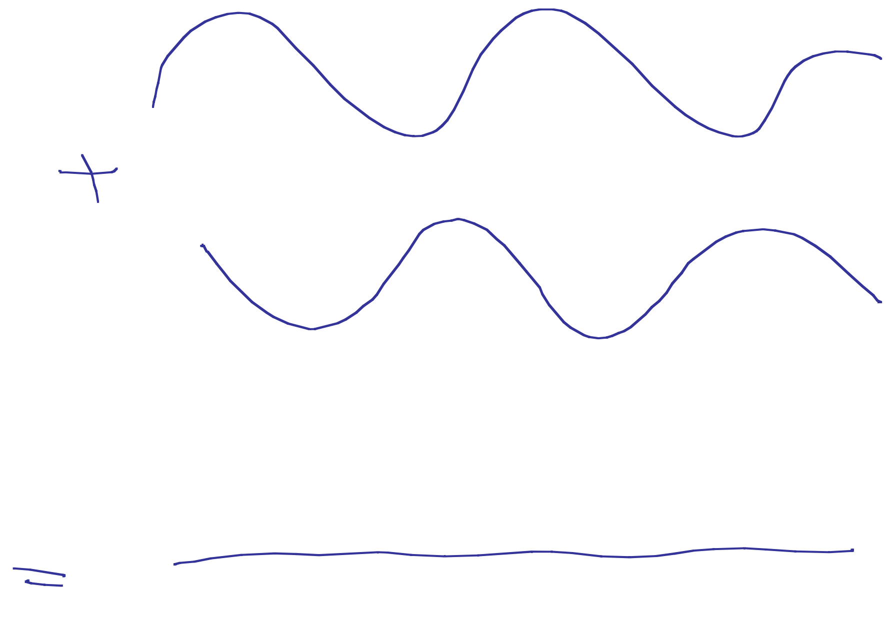
Displacements of waves arising from separate sources add together







Constructive interence



Destructive interfence

Phase matters

Harmonic waves are essential useful because any wave can be treated as a sum of harmonic waves

→ Fourier analysis

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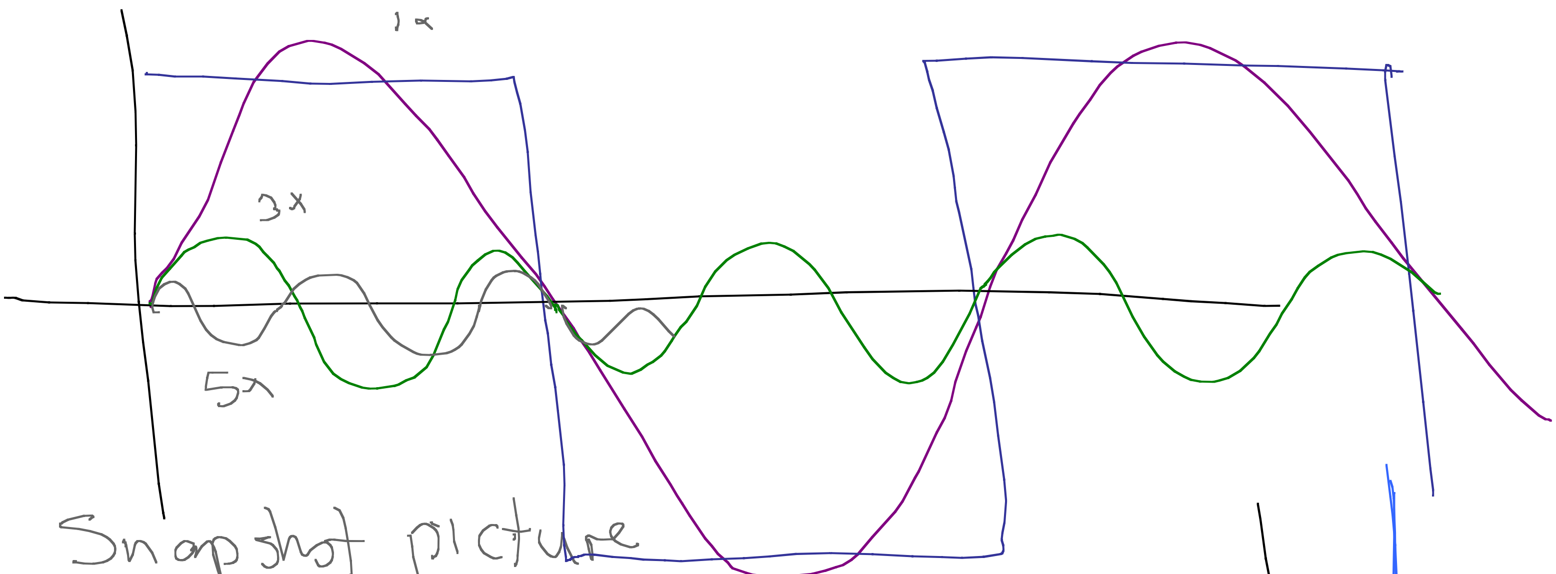
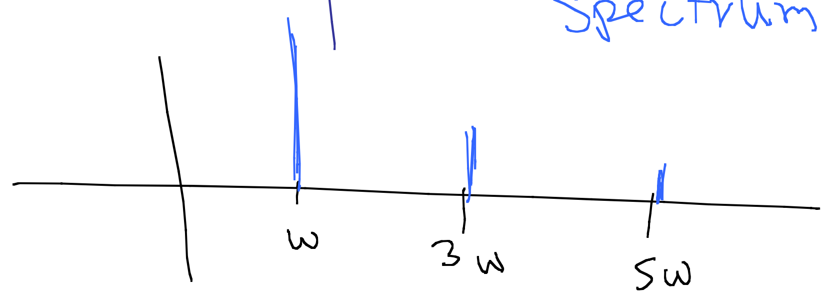
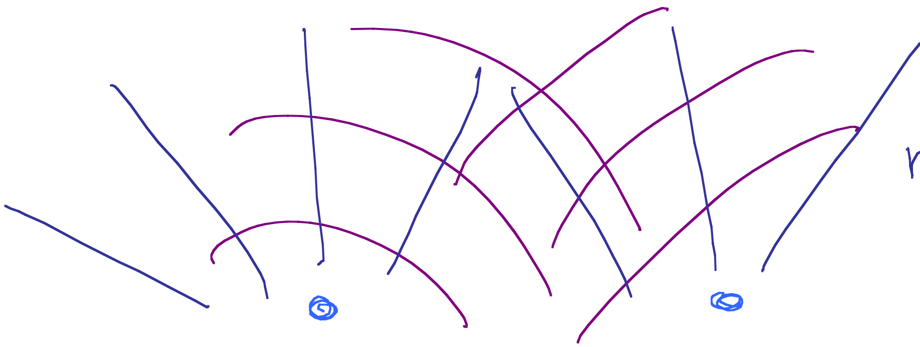


Snapshot picture

Fourier Frequency Spectrum





nodal lines

Env at $\frac{1}{2}(f_1 - f_2)$

Rate at which pulses

Env $2 \times \frac{1}{2}|f_1 - f_2|$

$= |f_1 - f_2|$

$= f_{Beat}$

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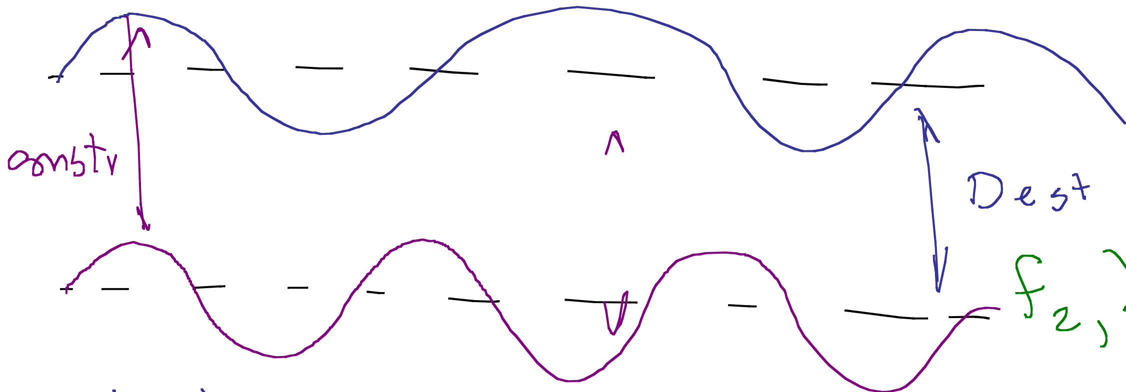
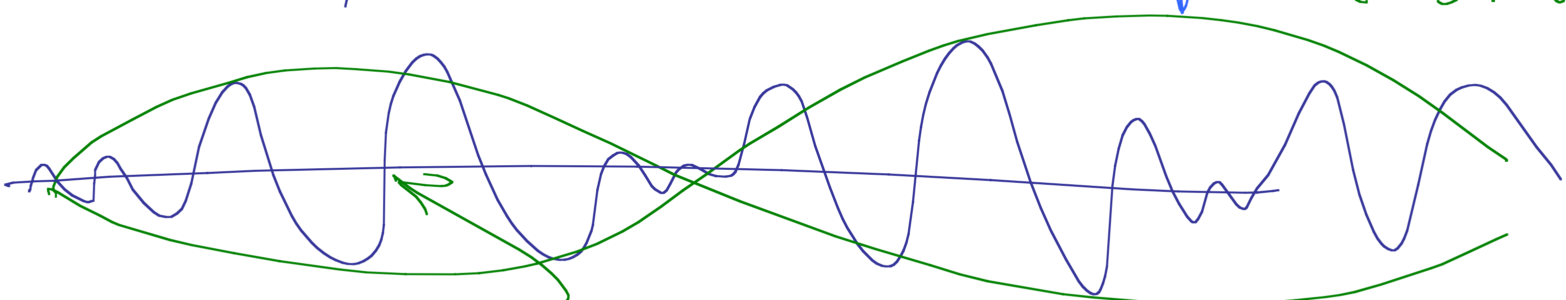
λ_1, f_1



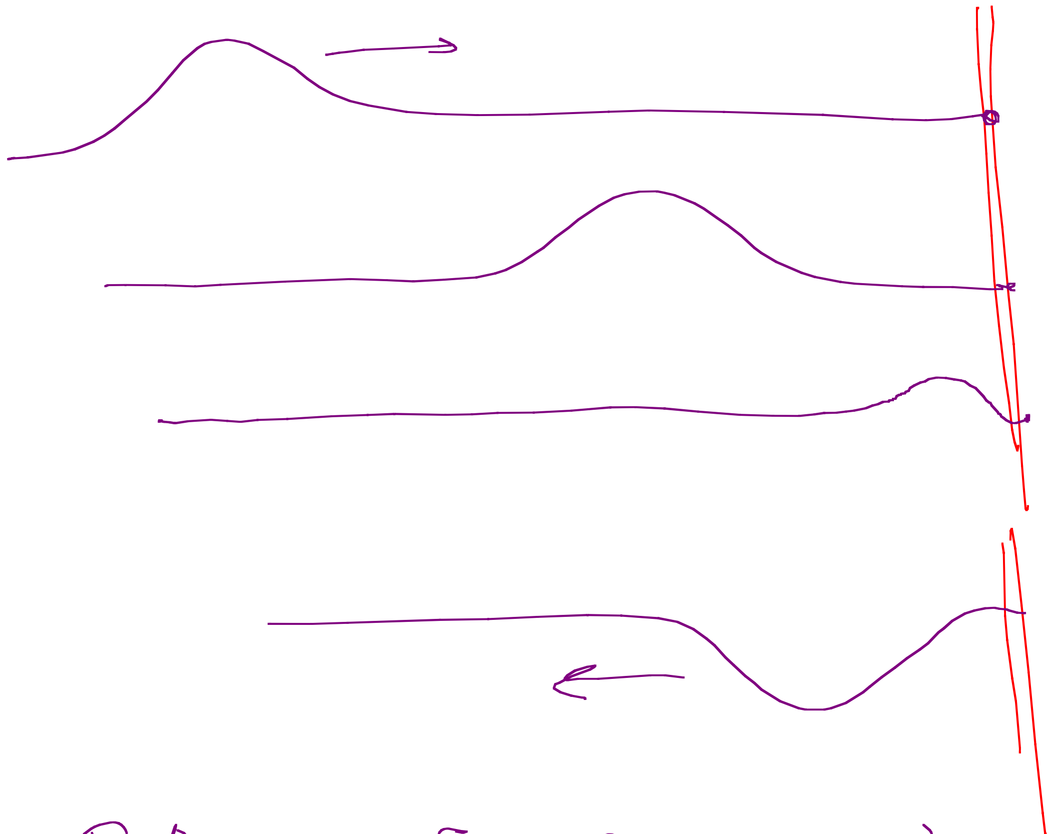
f_2, λ_2

whatever)

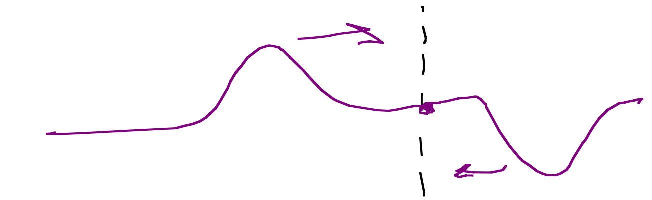
Envelope modulates fast wave



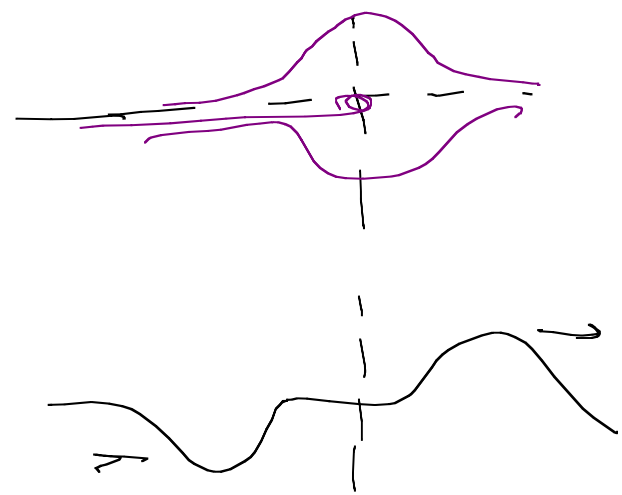
freq $= \frac{1}{2}(f_1 + f_2)$

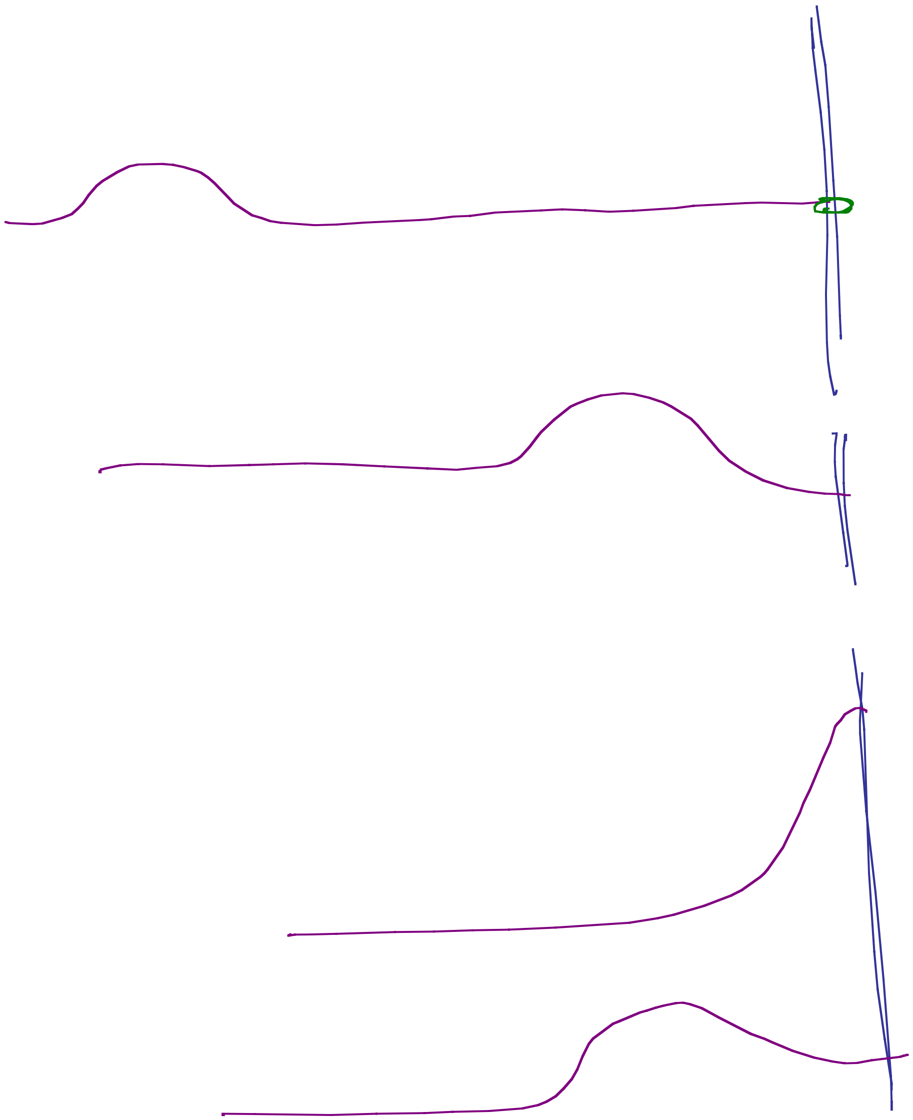


Reflection from fixed end gives a negative pulse.



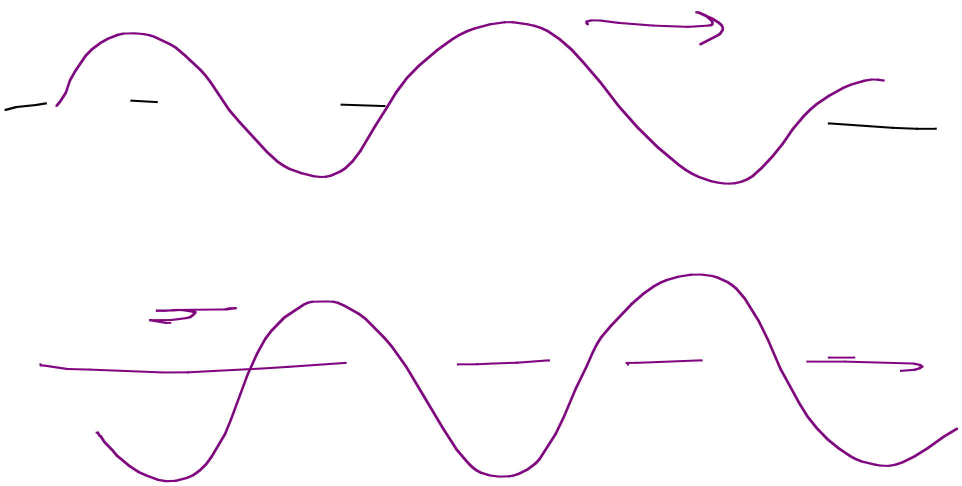
Imagine a neg. pulse from other side of wall.





When end is free to move, then positive wave is reflected.

Standing Waves



Two waves,
same freq, λ,
speed v
Opp dir of motion

$A\cos(kx - \omega t)$ To right

$A\cos(kx + \omega t)$ To left

Get a "wave" stays in one place, oscillates.

No displacment = Nodes ($\frac{1}{2}\lambda$ apart)

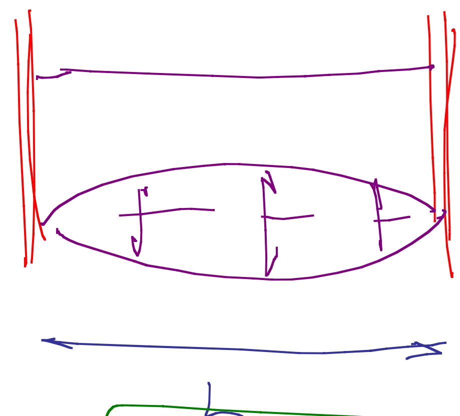
Max dipl. = Antinodes ($\lambda/4$ away from nearest node)

<u>Pattern</u> oscillates w/ same freq f
as each orig. wave

v = speed of waves for each orig. wave

Standing wave can generated on a string
clamped at both ends

Simplest pattern
(Lowest mode, lowest harmonic)



For this one $L = \lambda/2$

Frequency $= f = v/\lambda = \dfrac{v}{2L} = \boxed{\dfrac{v}{2L}}$