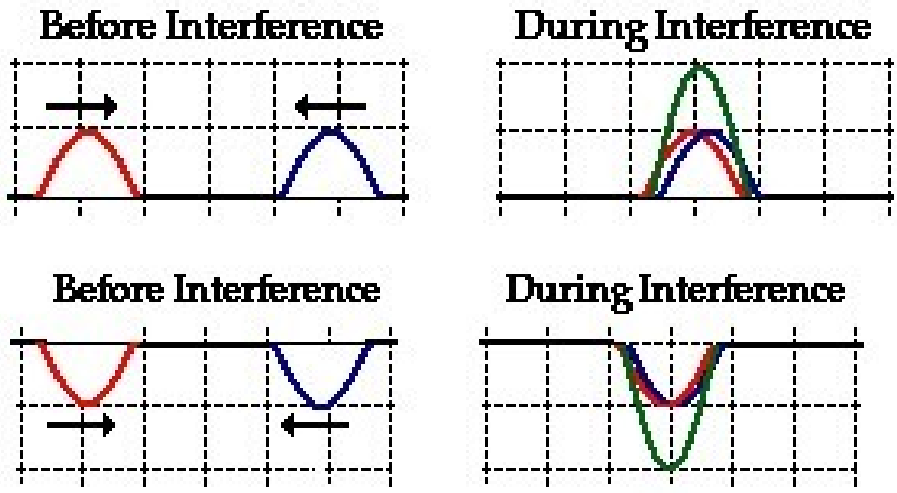
Interference of Waves

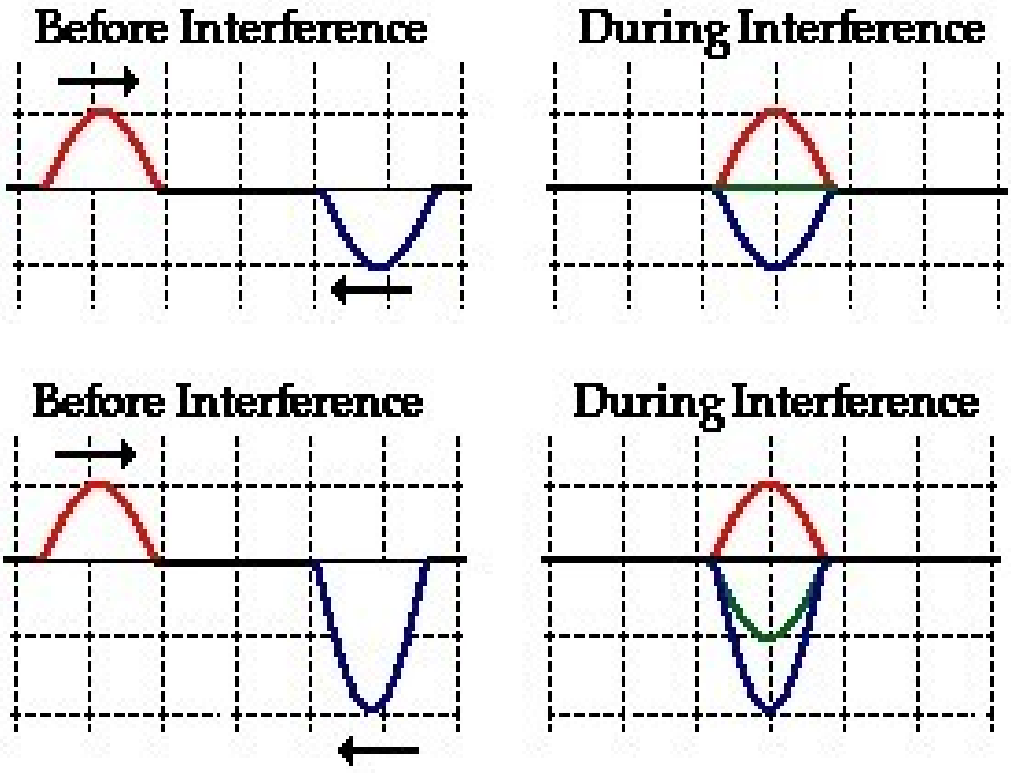
Applet Menu

- Wave interference is when two or more waves act simultaneously on the same particles of a medium.
- Principle of Superposition: The resultant displacement of a given particle is equal to the sum of the displacements that would have been produced by each wave acting independently.

- Constructive interference results when two of more waves interfere to produce a resultant displacement greater than the displacement caused by either wave itself.



- Destructive Interference is when the resultant displacement is smaller than the displacement that would be caused by one wave by itself.

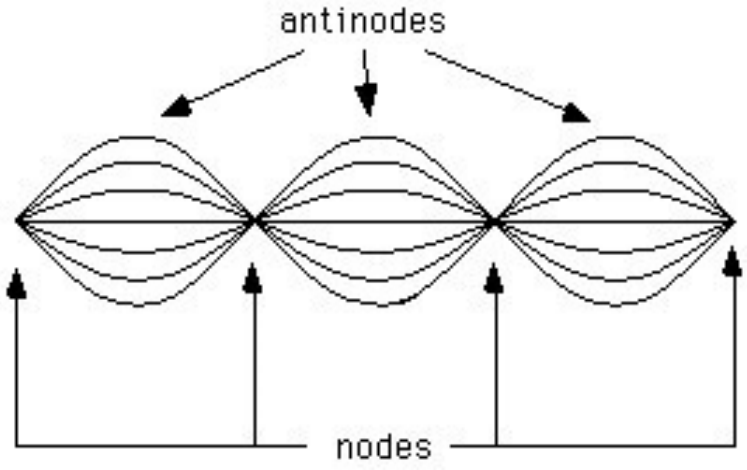


Review by reading MHR page 355 - top of 356.

Standing Waves: Interference in One Dimension

⇨ A standing wave interference pattern occurs if interfering waves have the same amplitude, wavelength, frequency, and are traveling in opposite directions.

- Called a standing wave for short.



⇨ The node, or nodal point, is where crests and troughs of equal amplitude interfere destructively. For one-dimensional waves the fixed ends are nodal points.

⇨ The antinodes, or loops, are areas of constructive interference.

⇨ The number of nodal points for a given medium depends on the physical structure of that medium, thus only certain frequencies will produce a standing wave pattern. Such frequencies are resonance frequencies for that medium.

- If one antinode were created with a certain frequency, say f_1, then to create two or three antinodes (etc.) the frequency would have to be $2f_1$, or $3f_1$ respectively. Note the decrease in amplitude as more antinodes are created.