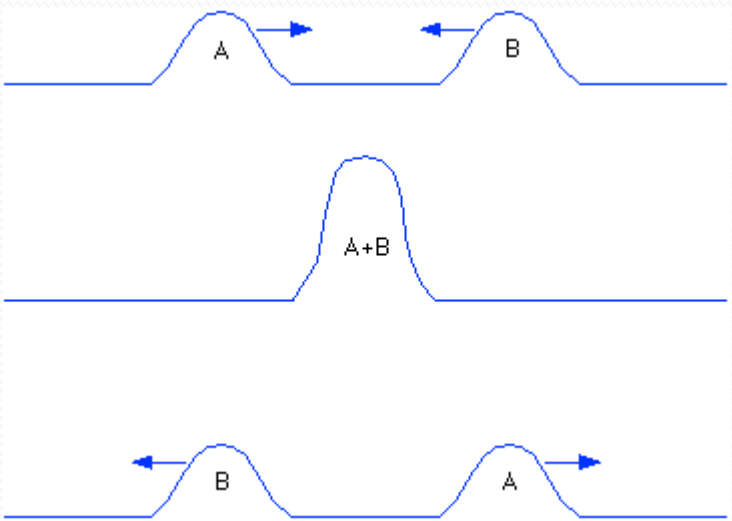
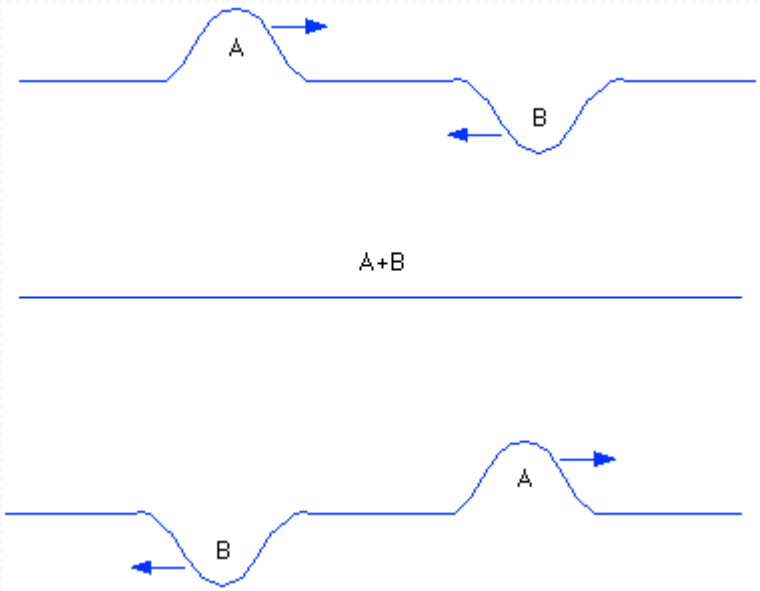
2-D Interference From 2 Point Sources

Recall:

- Constructive Interference



- Deconstructive Interference

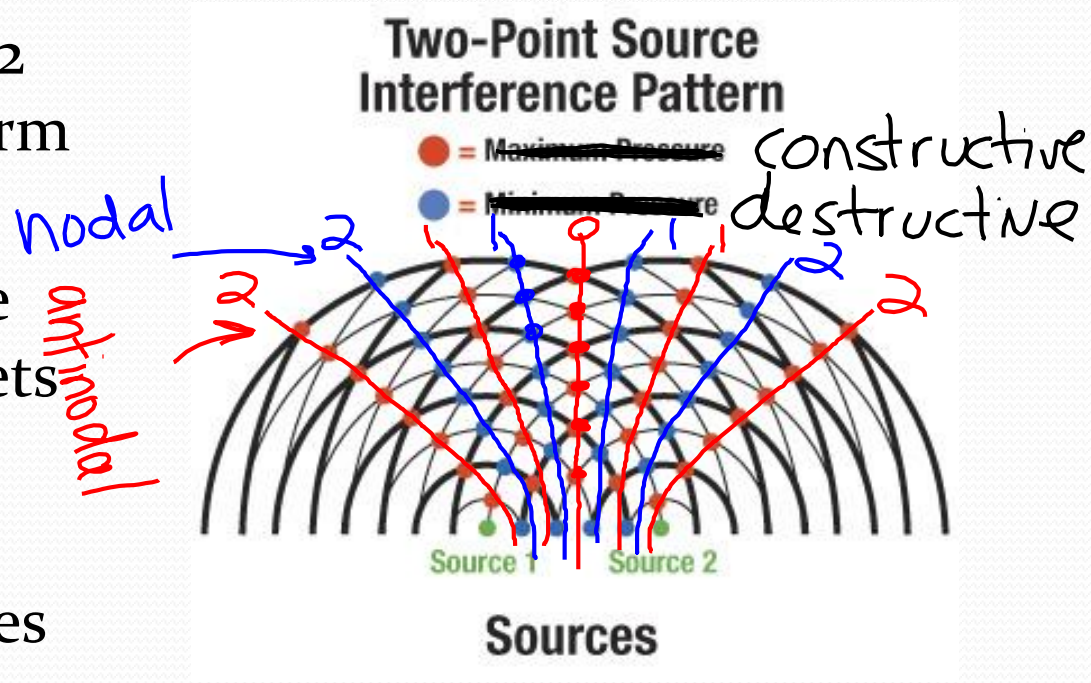


Let’s see it in action

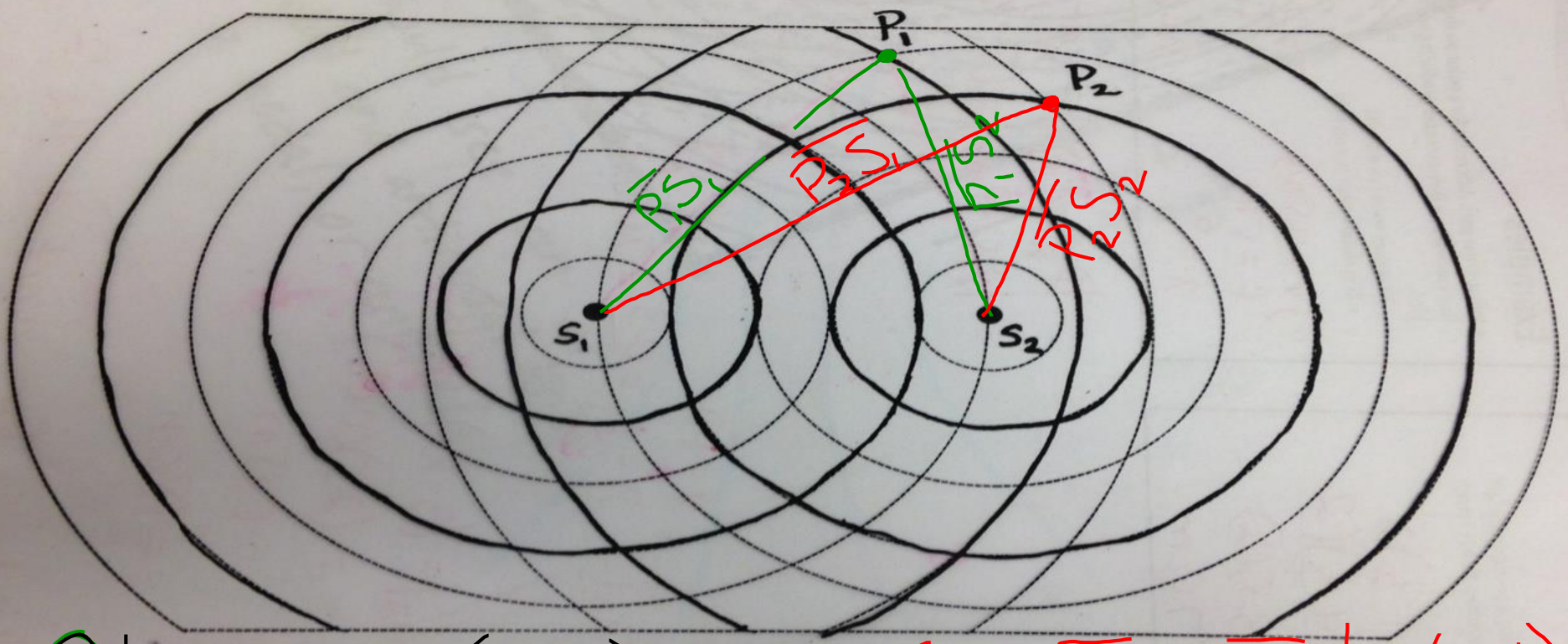
- http://www.youtube.com/watch?v=_BbkDTrYVhM&safe=active
- http://www.falstad.com/ripple/

Nodal and Antinodal Lines

- Constructive interference occurs when 2 crests or 2 troughs meet. These form antinodal lines
- Destructive interference occurs when a crest meets a trough. These form nodal lines.
- Nodal and antinodal lives are numbered from the inside-out



$$\left|\overline{P_nS_1} - \overline{P_nS_2}\right| = \left(n - \frac{1}{2}\right)\lambda$$



① $\left|P_1S_1 - P_1S_2\right| = \left(1 - \frac{1}{2}\right)\lambda$

$\left|3 - 2.5\right|$

$0.5 = 0.5$

—— crest

- - - - - trough

② $\left|\overline{P_2S_1} - \overline{P_2S_2}\right| = \left(2 - \frac{1}{2}\right)\lambda$

$\left|3.5 - 2\right| = 1.5$

$1.5 = 1.5$

Examples

- 1. What is the path difference for a point on the 4th nodal line created by 2 point sources if they create waves with $\lambda = 2.0$ cm?

$$\left|\overline{P_4S_1} - \overline{P_4S_2}\right| = \left(4 - \tfrac{1}{2}\right)2$$

$$= (3.5)2$$

$$= 7 \text{ cm}$$

Examples

- What is the path difference for a point on the 3rd nodal line created by 2 point sources producing waves at 5.0 Hz?
  - A) in deep water (v = 0.5 m/s)
  - B) in shallow water (v = 0.3 m/s)

A) $v = f\lambda$

$\lambda = \frac{v}{f} = \frac{0.5}{5} = 0.1\,m$

$|\overline{P_3S_1} - \overline{P_3S_2}| = (3 - 0.5)0.1$

$= 2.5(0.1)$

$= 0.25\,m$

B) $\lambda = \frac{v}{f} = \frac{0.3}{5} = 0.06\,m$

$|\overline{P_3S_1} - \overline{P_3S_2}| = (3 - 0.5)0.06$

$= 2.5(0.06)$

$= 0.15\,m$