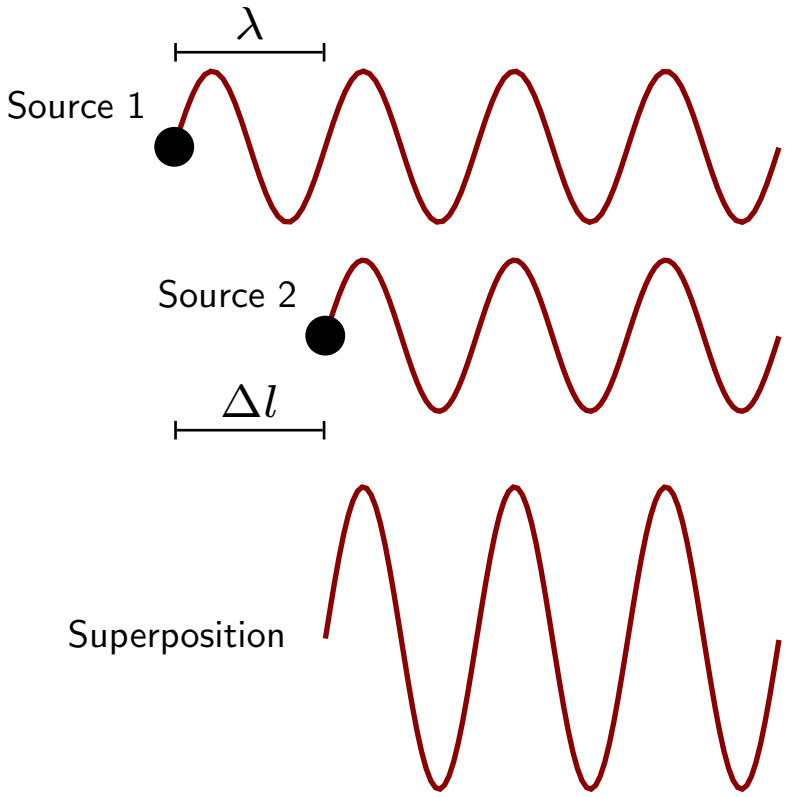
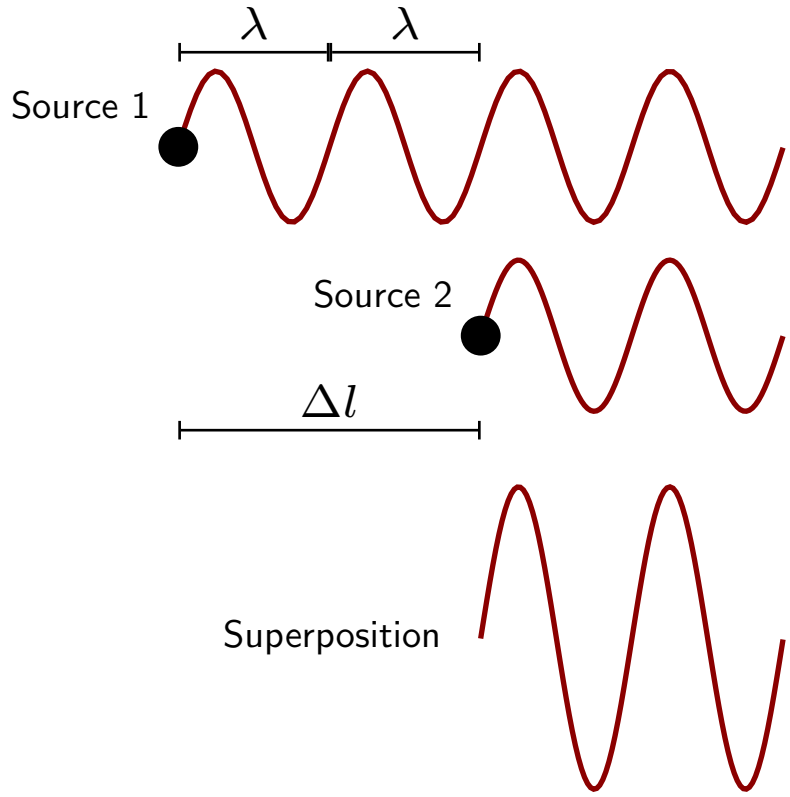
Waves from Two Sources: Constructive Interference

Sources offset by one wavelength.



Sources offset by two wavelengths.



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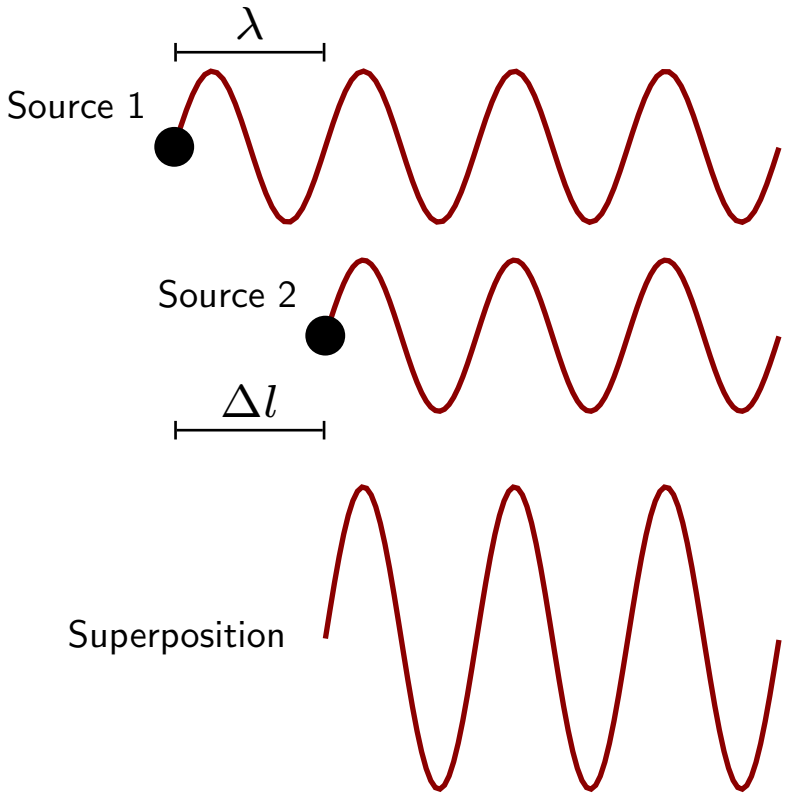
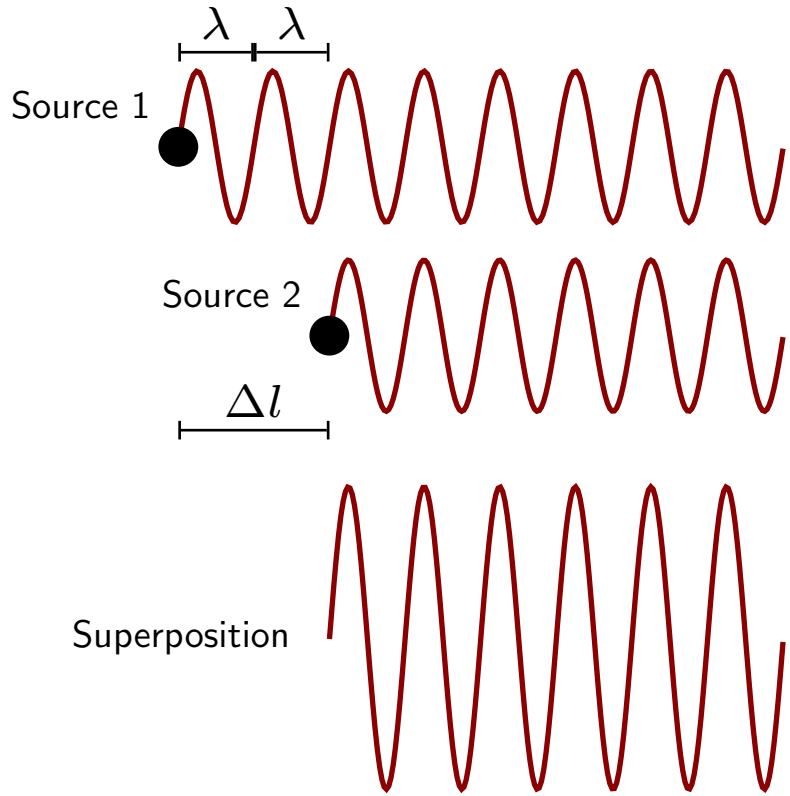
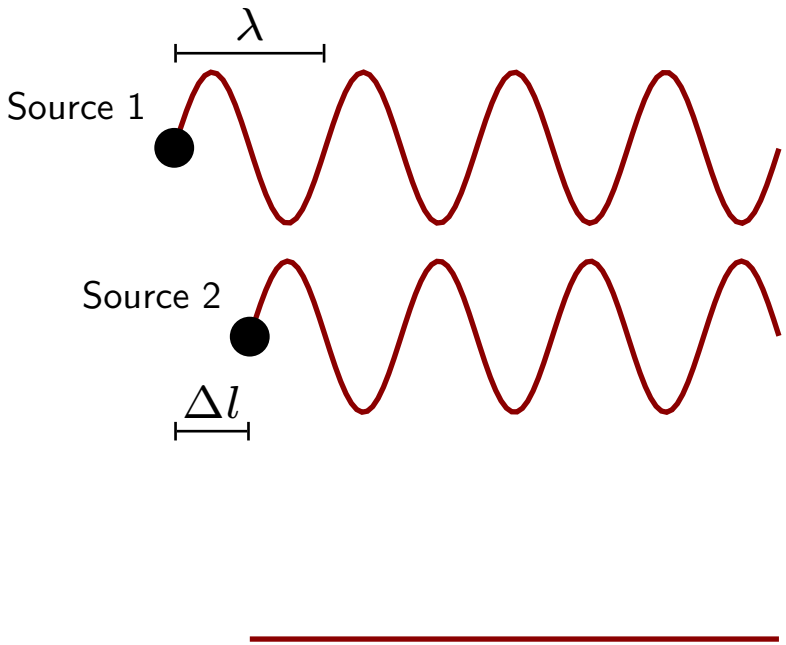


Sources offset by two wavelengths.

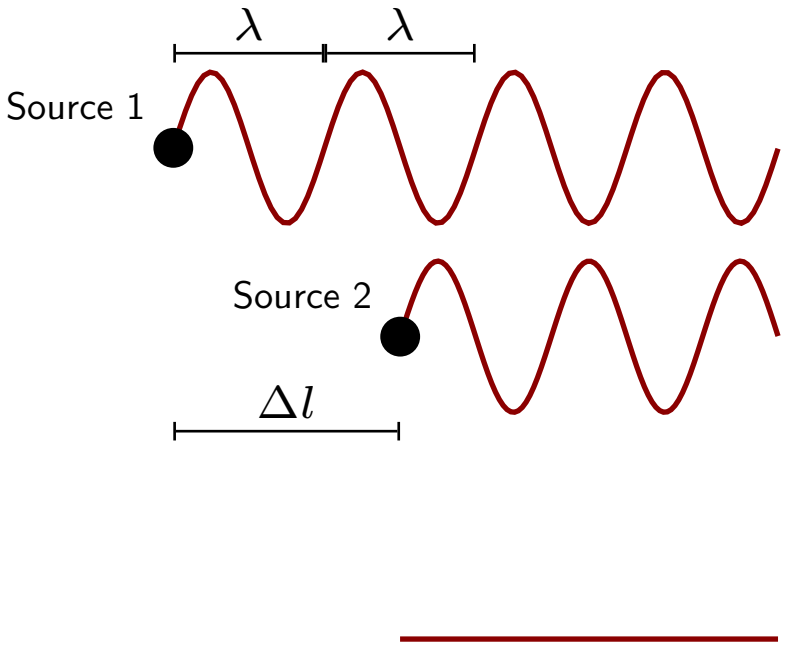


Waves from Two Sources: Destructive Interference

Sources offset by one half wavelength.

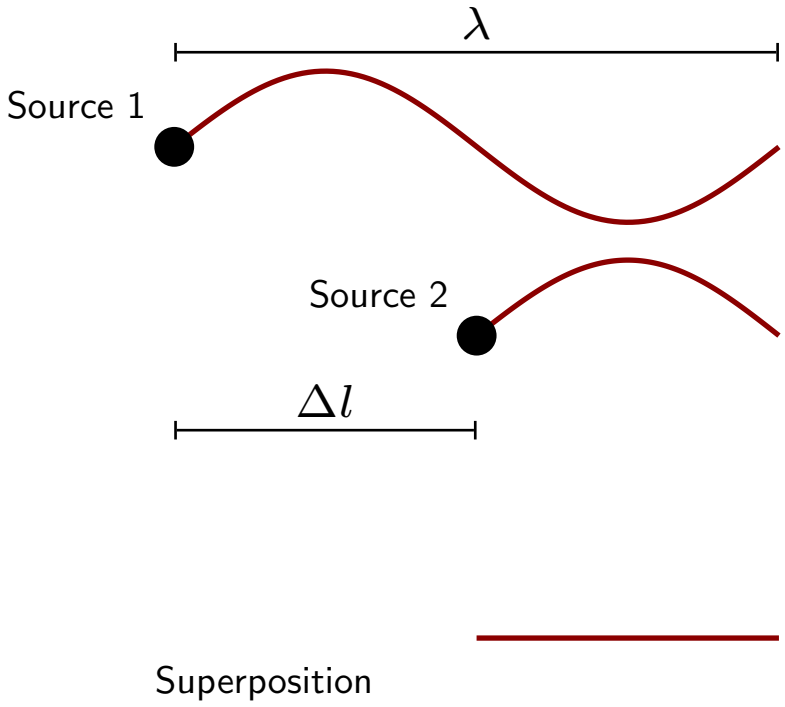


Sources offset by one and a half wavelengths.

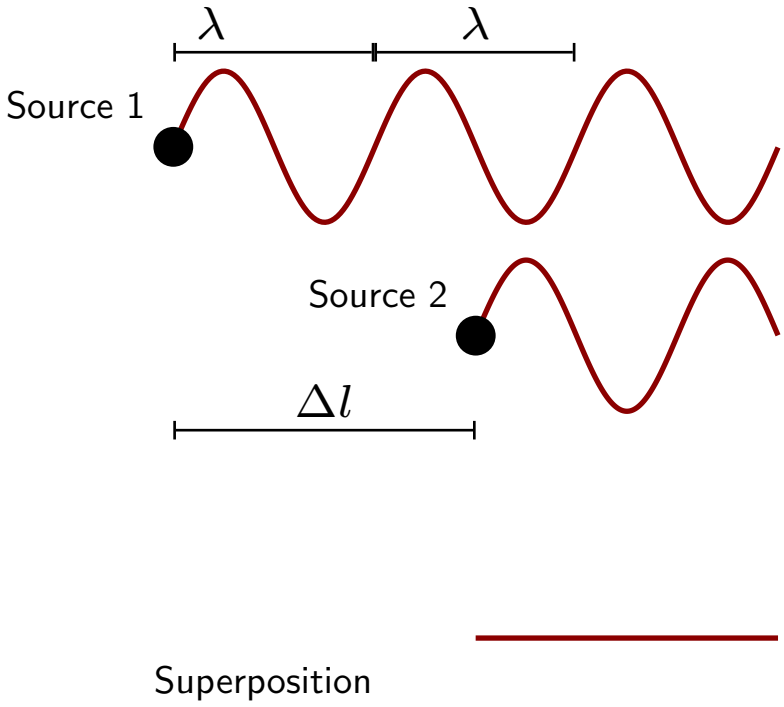


Waves from Two Sources: Destructive Interference

Sources offset by half wavelength.



Sources offset by one and a half wavelengths.



Question 1

Two sources, which oscillate with the same amplitude, produce waves with the same wavelength of $1.0\,\mathrm{m}$. The sources are separated by $2.5\,\mathrm{m}$.

Which of the following is/are true regarding the displacement beyond both sources?

1. The displacement is never exactly $0\,\mathrm{m}$ at any point at any time.
2. The displacement is exactly $0\,\mathrm{m}$ at all points and all times.
3. The displacement can be exactly $0\,\mathrm{m}$ at all points but this only occurs at certain special times.
4. The displacement is exactly $0\,\mathrm{m}$ at certain (but not all) points at all times.

Question 2

Two sources, which oscillate with the same amplitude, produce waves with the same wavelength of $1.0\,\mathrm{m}$. The sources are separated by $2.0\,\mathrm{m}$.

Which of the following is/are true regarding the displacement beyond both sources?

1. The displacement is never exactly $0\,\mathrm{m}$ at any point at any time.
2. The displacement is exactly $0\,\mathrm{m}$ at all points and all times.
3. The displacement can be exactly $0\,\mathrm{m}$ at all points but this only occurs at certain special times.
4. The displacement is exactly $0\,\mathrm{m}$ at certain (but not all) points at all times.

Question 3

Consider

$$z = e^{i\alpha} + e^{i\beta}$$

for and α and β.

Which of the following is true?

1. $z = e^{i(\alpha+\beta)} e^{i(\alpha-\beta)}$
2. $z = e^{i(\alpha+\beta)/2} e^{i(\alpha-\beta)}$
3. $z = e^{i(\alpha+\beta)/2} \left[e^{i(\alpha-\beta)/2} + e^{i(\alpha-\beta)/2} \right]$
4. $z = e^{i(\alpha+\beta)/2} \left[e^{i(\alpha-\beta)/2} + e^{-i(\alpha-\beta)/2} \right]$
5. $z = e^{i(\alpha+\beta)/2} \left[e^{i(\alpha-\beta)/2} - e^{i(\alpha-\beta)/2} \right]$

Question 4

Two sources, separated by distance Δx, each oscillate with the same frequency, producing waves with the same wavenumber k.

When does constructive interference arise?

1. $\Delta x = 0, \frac{\pi}{k}, \frac{2\pi}{k}, \ldots$
2. $\Delta x = 0, \frac{2\pi}{k}, \frac{4\pi}{k}, \ldots$
3. $\Delta x = 0, \pi k, 2\pi k, \ldots$
4. $\Delta x = 0, 2\pi k, 4\pi k, \ldots$