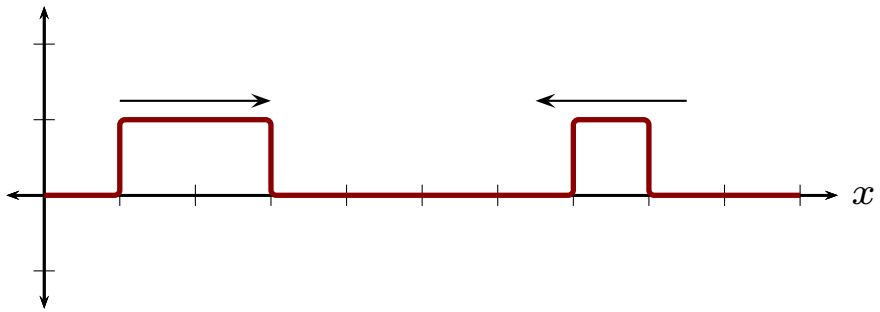
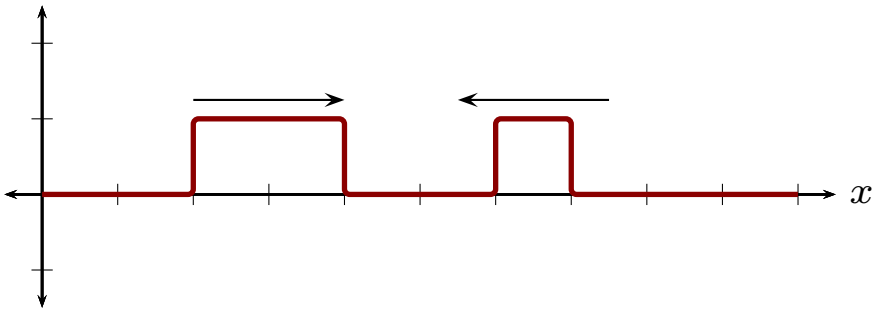
Interference of Pulses

A snapshot of a string at $t = 0\,\text{s}$ displays two pulses traveling toward each other. The horizontal units are cm. Suppose that the pulses travel with speed $1\,\text{cm/s}$.

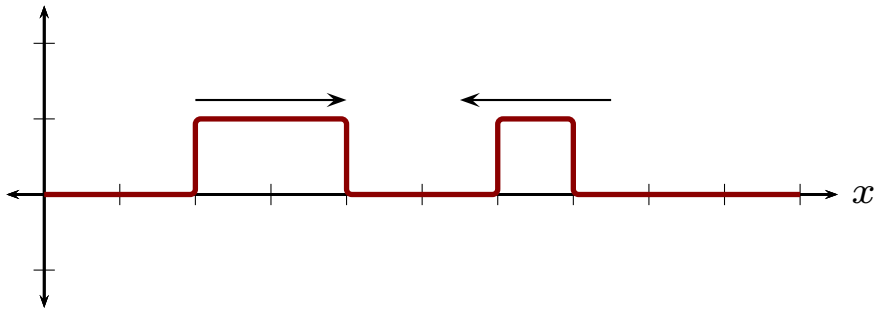


At $t = 1\,\text{s}$ the pulses appear as:

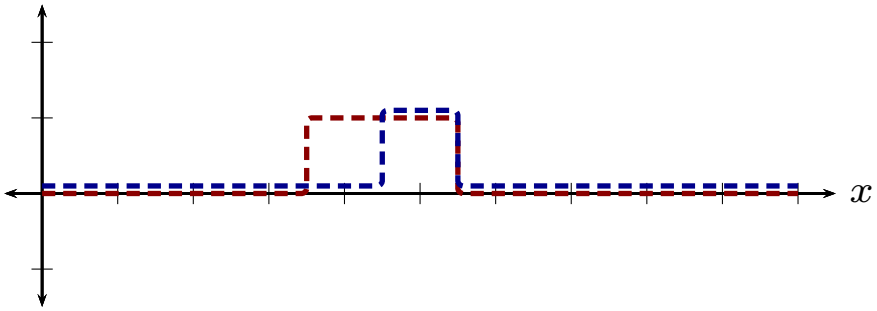


Interference of Pulses

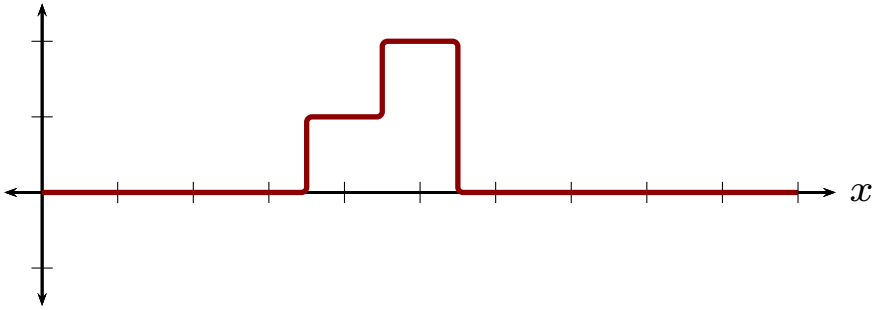
A snapshot of a string at $t = 1\,\text{s}$ is as follows.



At $t = 2.5\,\text{s}$ the individual pulses and their superposition appear as:

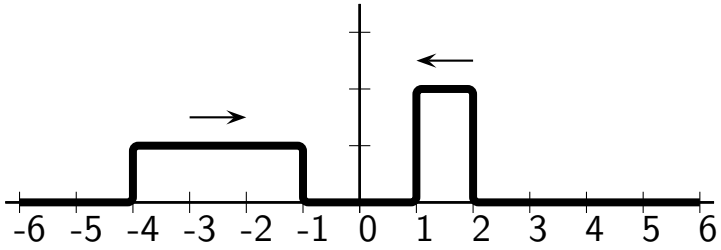


Add to give:

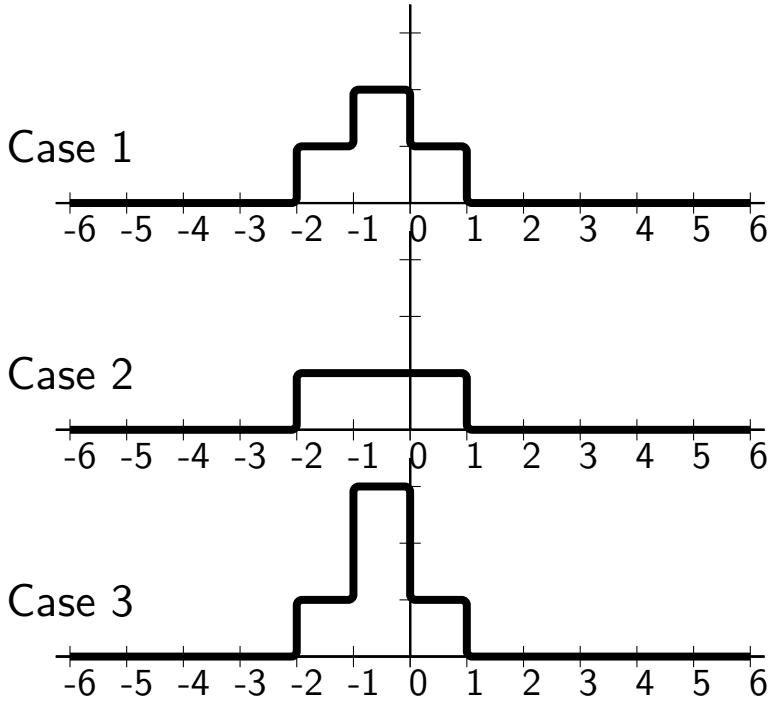


Question 1

Two pulses approach each other on a string. At an initial instant the string is as illustrated and the pulses travel with speed 1 unit per second.

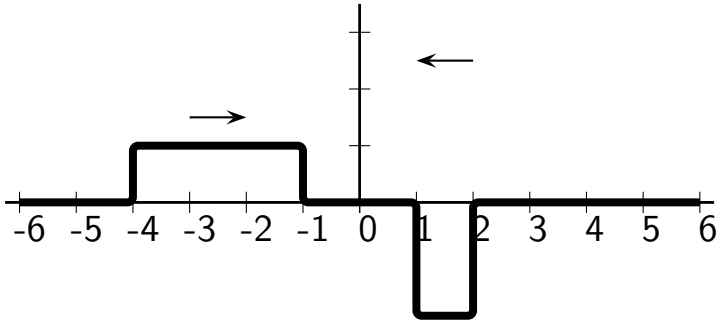


Which of the following is an accurate depiction of the entire string at an instant 2 seconds later?

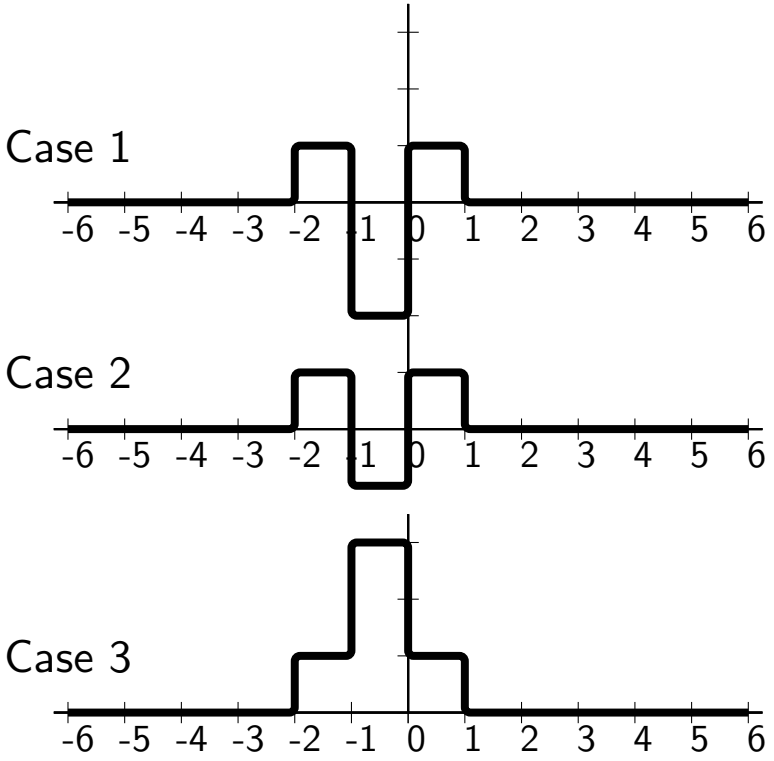


Question 2

Two pulses approach each other on a string. At an initial instant the string is as illustrated and the pulses travel with speed 1 unit per second.

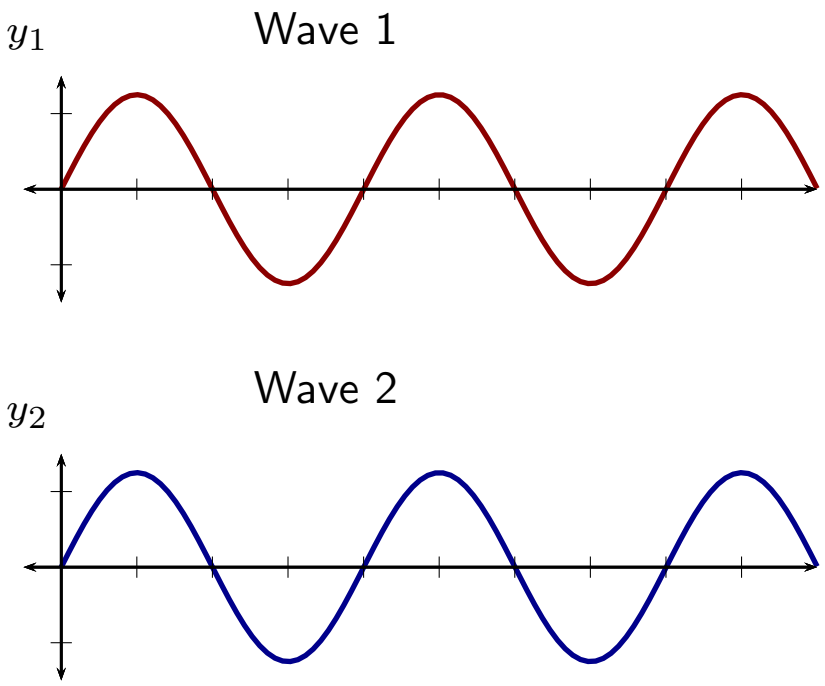


Which of the following is an accurate depiction of the entire string at an instant 2 seconds later?

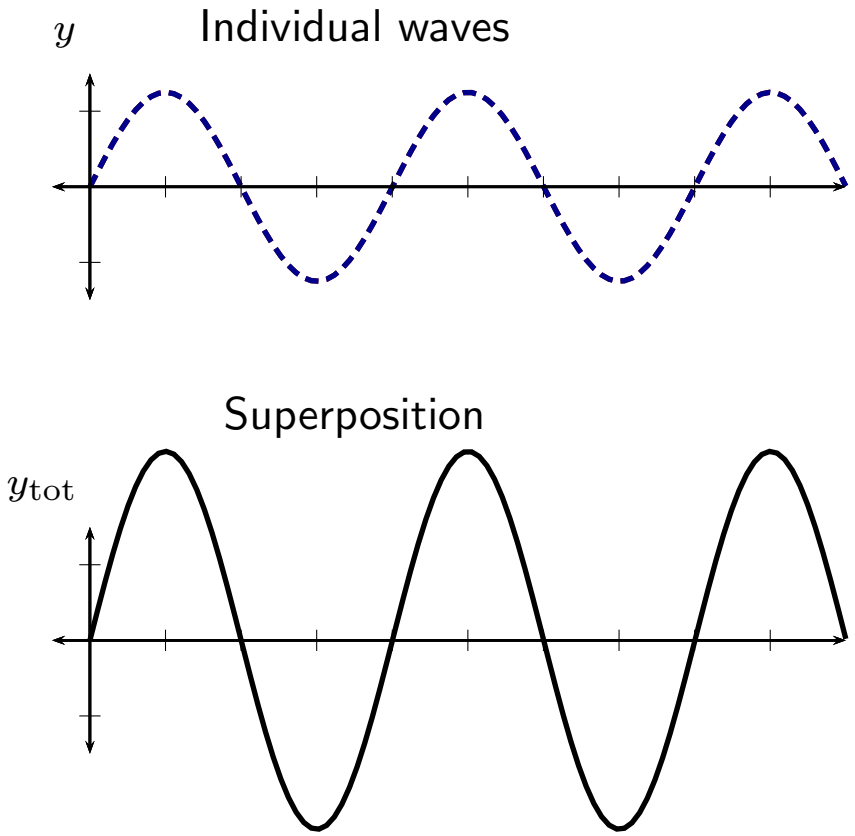


General Interference I

Snapshots of two waves at $t = 0\,\mathrm{s}$ in the same medium are illustrated whose phase difference is $\Delta\phi = 0$.

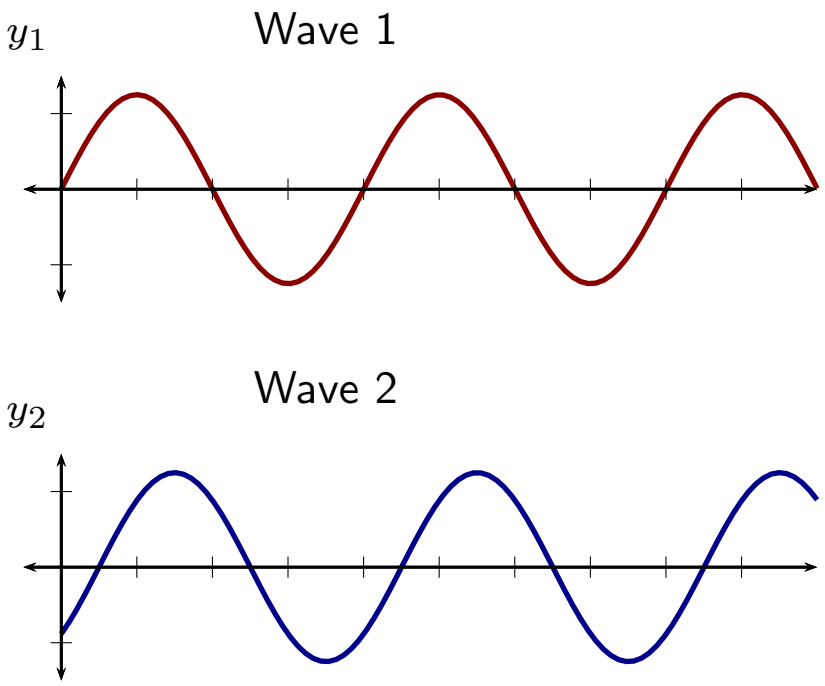


The superposition of the two waves is:

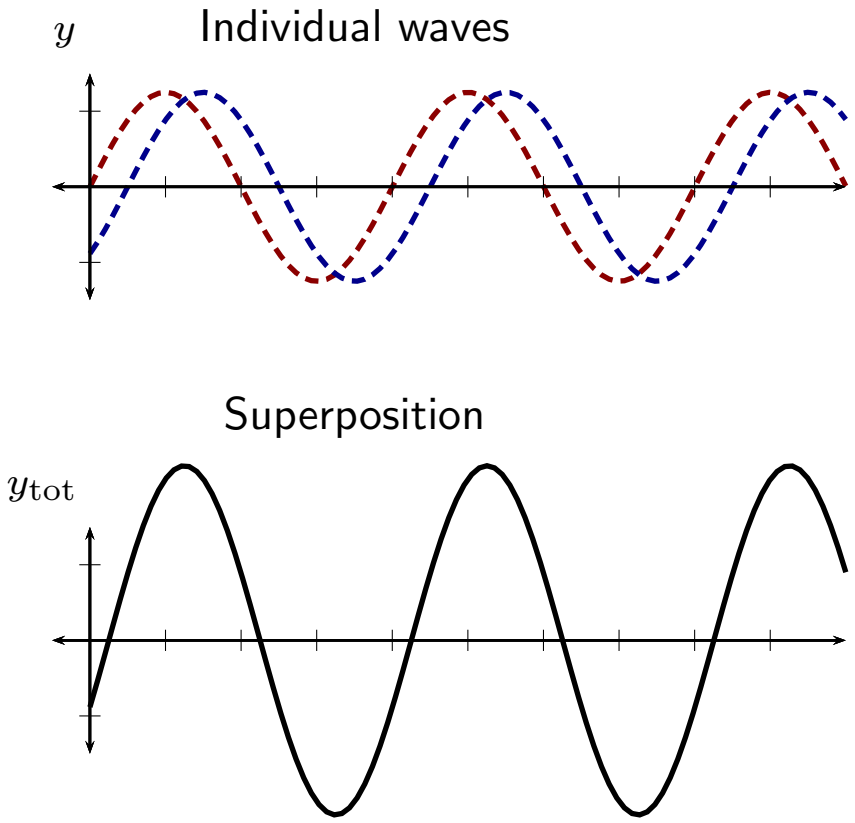


General Interference II

Snapshots of two waves at $t = 0\,\mathrm{s}$ in the same medium are illustrated whose phase difference is $\Delta\phi = \frac{\pi}{4}$.



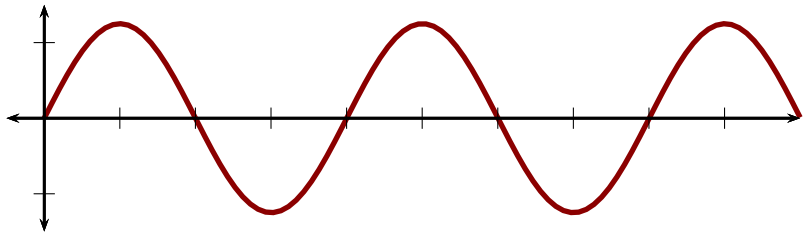
The superposition of the two waves is:



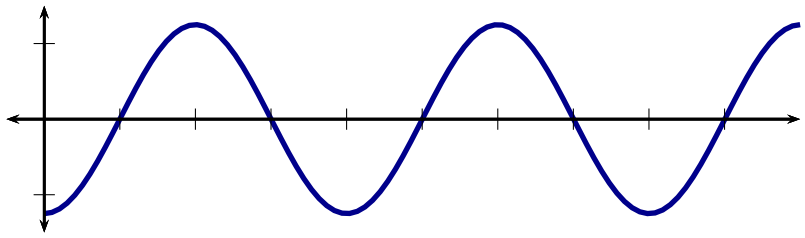
General Interference III

Snapshots of two waves at $t = 0\,\mathrm{s}$ in the same medium are illustrated whose phase difference is $\Delta\phi = \frac{\pi}{2}$.

y_1 Wave 1

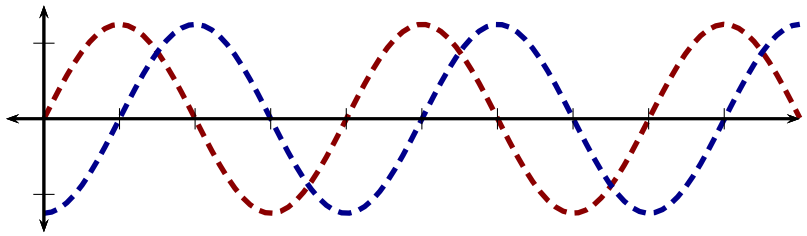


y_2 Wave 2



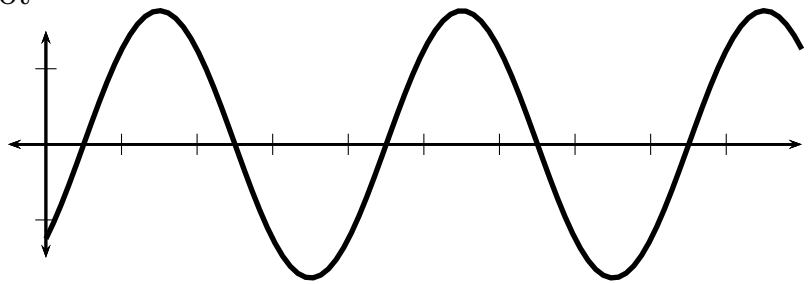
The superposition of the two waves is:

y Individual waves



Superposition

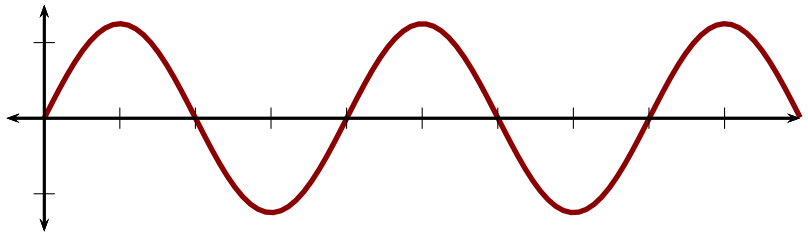
y_{tot}



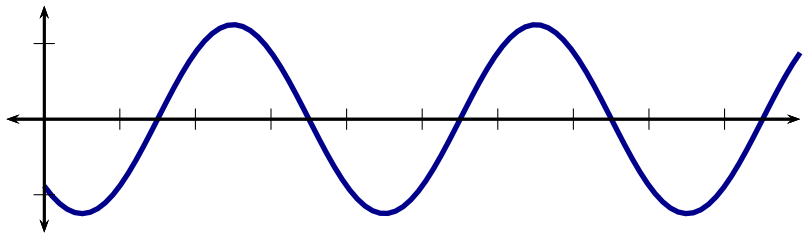
General Interference IV

Snapshots of two waves at $t = 0\,\mathrm{s}$ in the same medium are illustrated whose phase difference is $\Delta\phi = \frac{3\pi}{4}$.

y_1 Wave 1

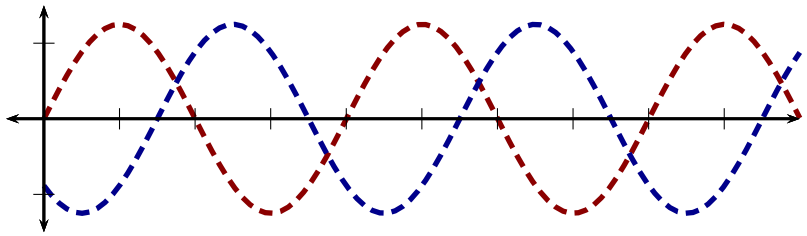


y_2 Wave 2



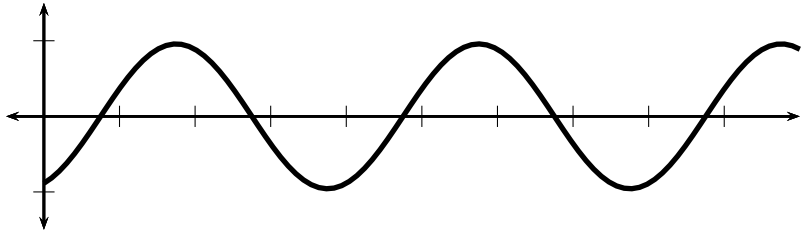
The superposition of the two waves is:

y Individual waves



Superposition

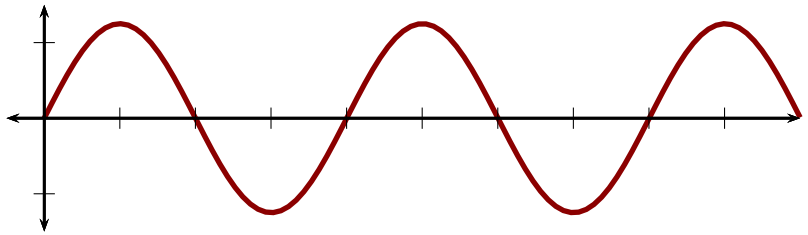
y_{tot}



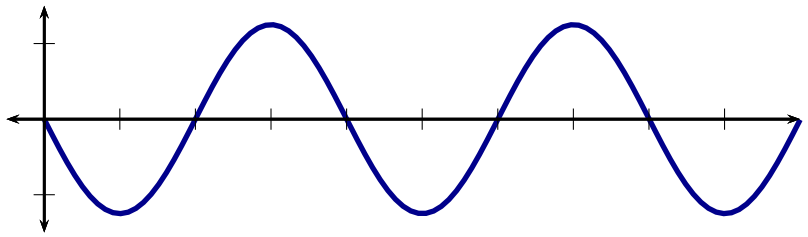
General Interference V

Snapshots of two waves at $t = 0\,\mathrm{s}$ in the same medium are illustrated whose phase difference is $\Delta\phi = \pi$.

y_1 Wave 1

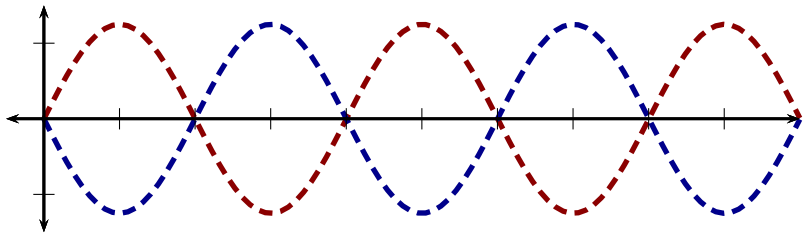


Wave 2 y_2

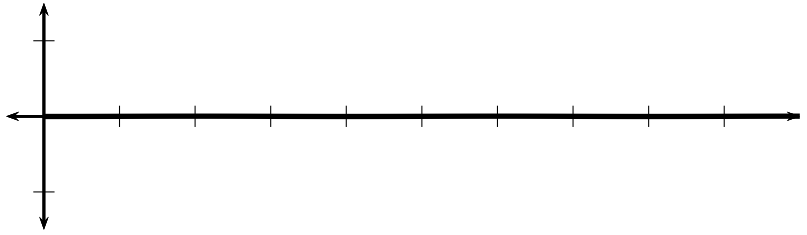


The superposition of the two waves is:

y Individual waves

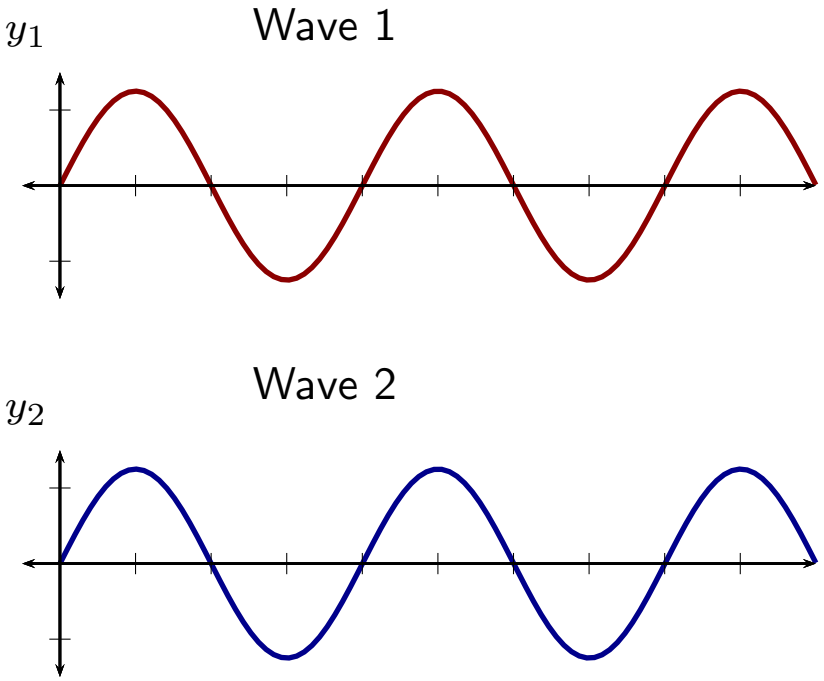


Superposition y_{tot}

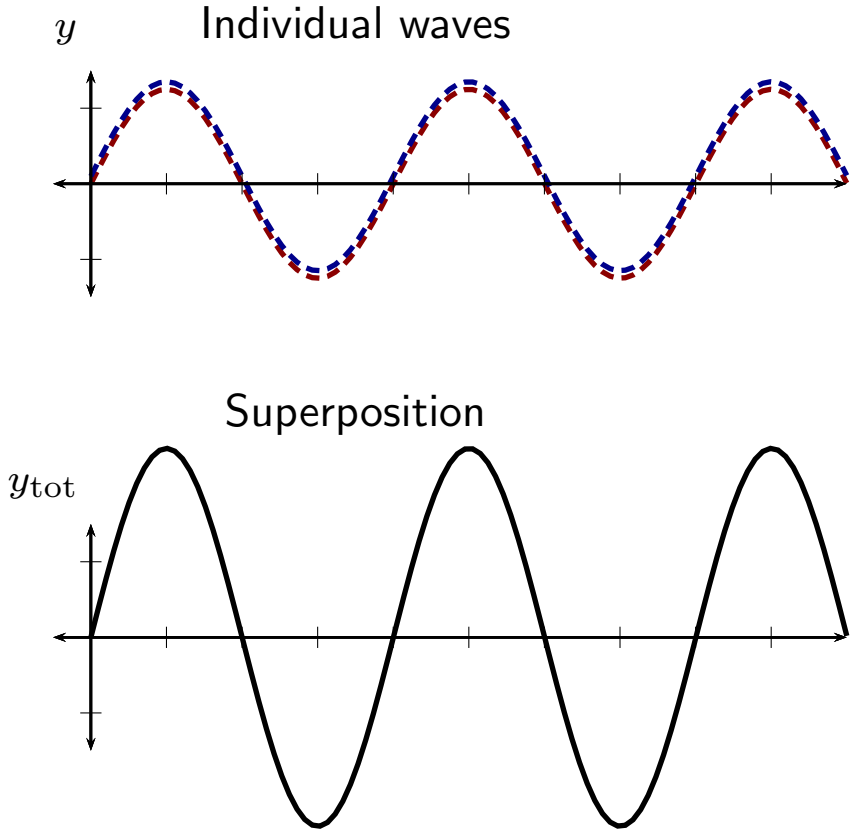


Constructive Interference

Snapshots of two waves at on instant in the same medium.

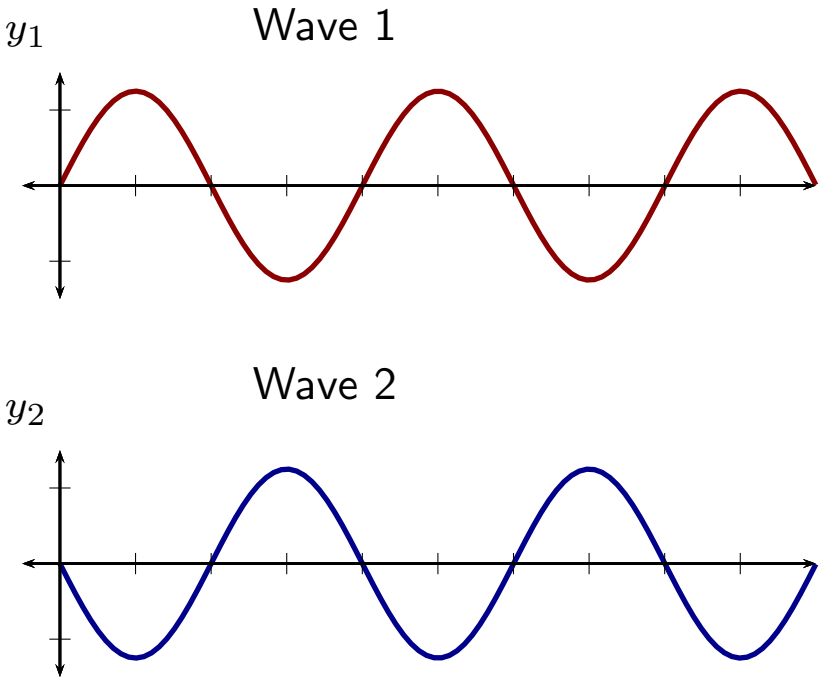


The superposition of the two waves is:

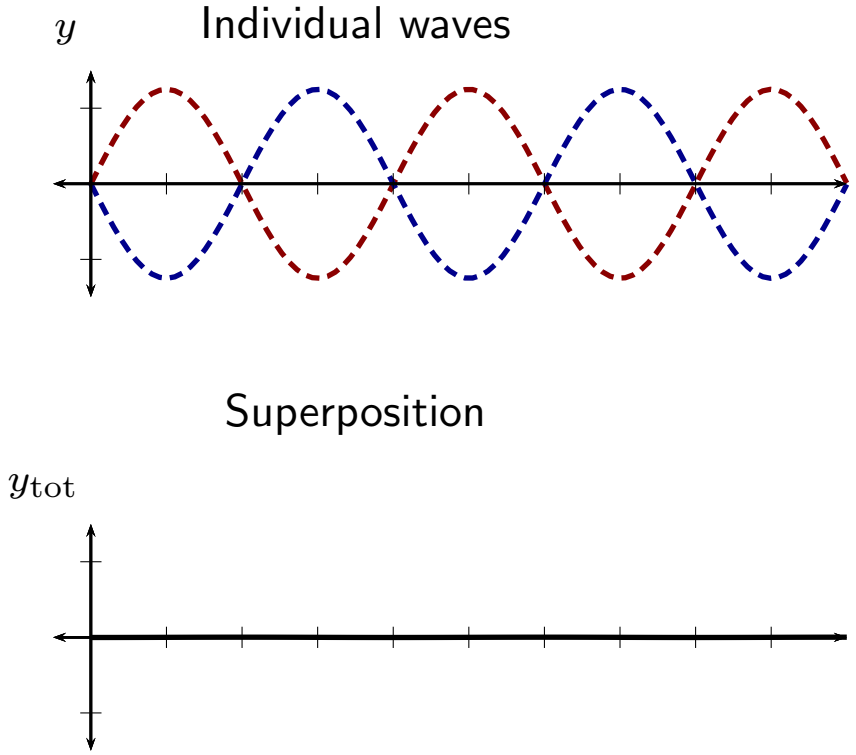


Destructive Interference

Snapshots of two waves at one instant in the same medium.

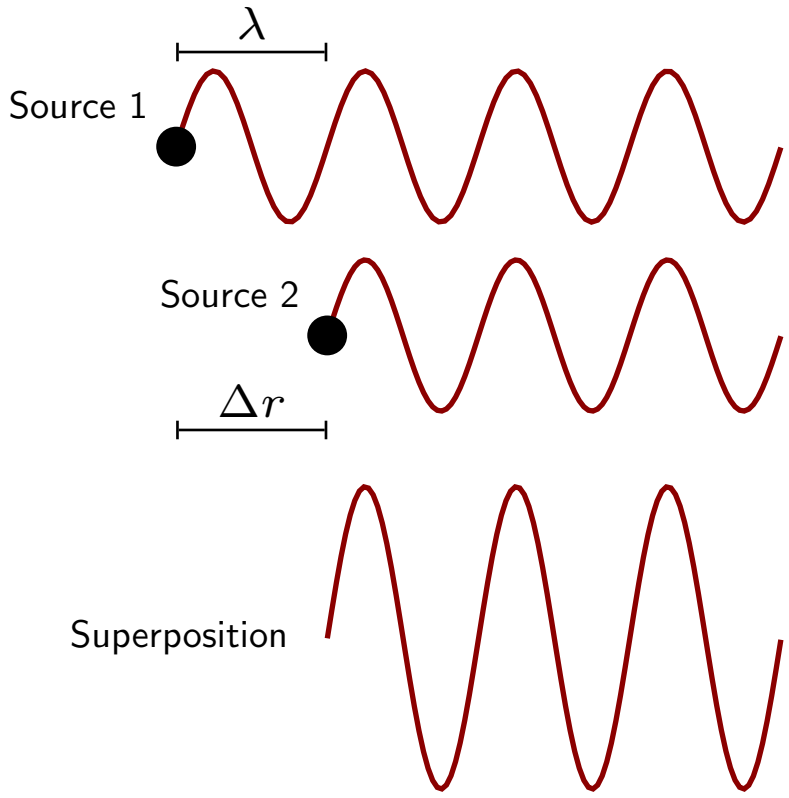


The superposition of the two waves is:

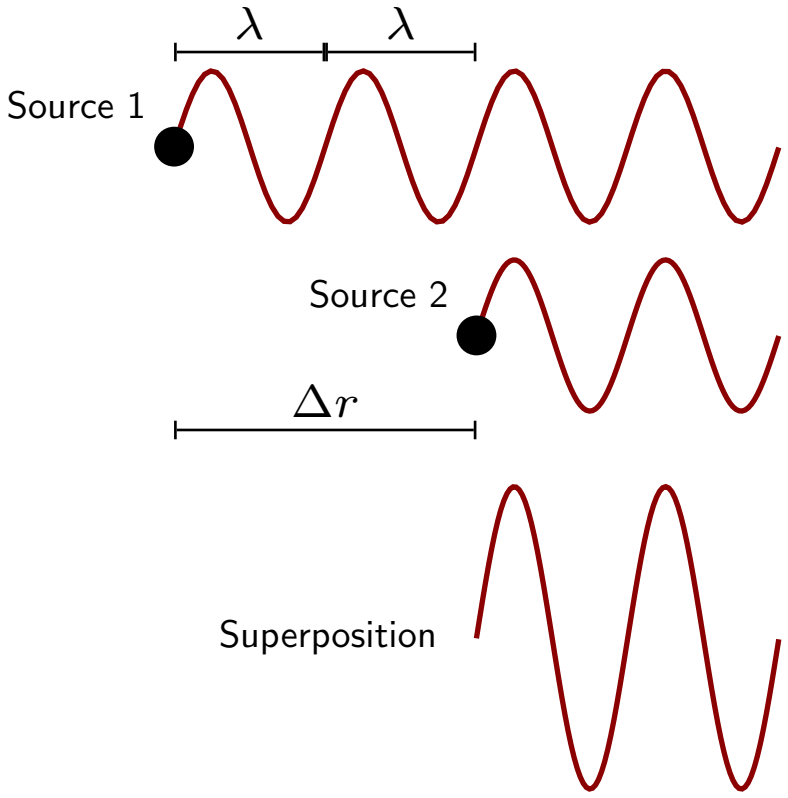


Waves from Two Sources: Constructive Interference

Sources offset by one wavelength.

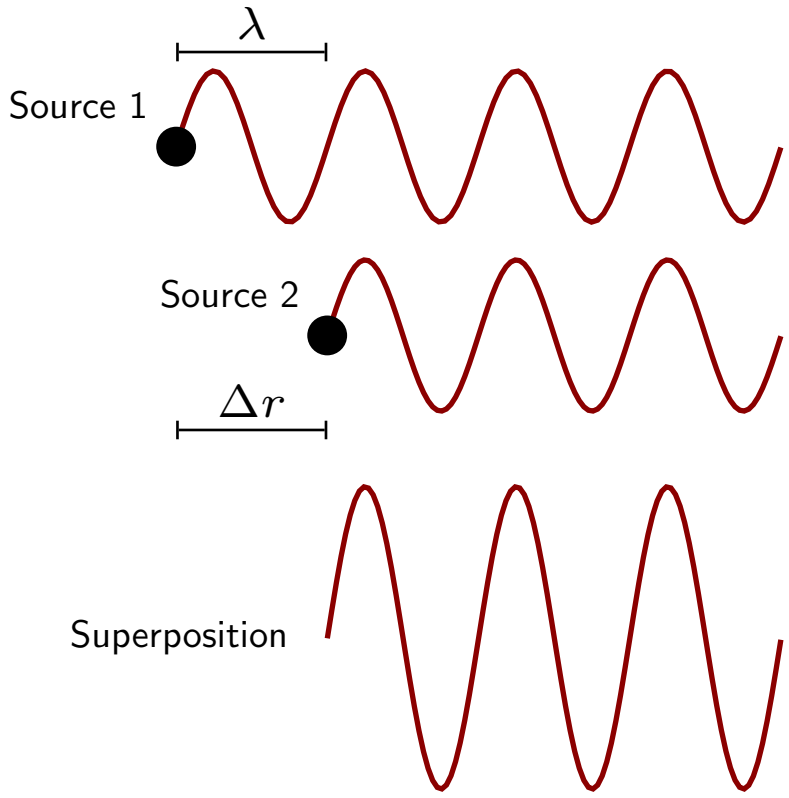


Sources offset by two wavelengths.

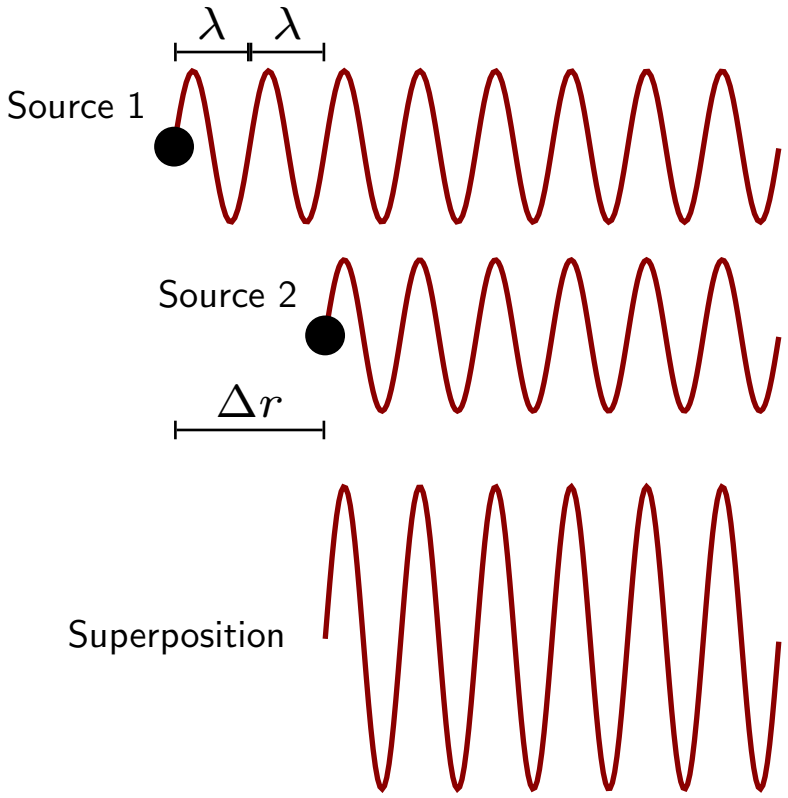


Waves from Two Sources: Constructive Interference

Sources offset by one wavelength.

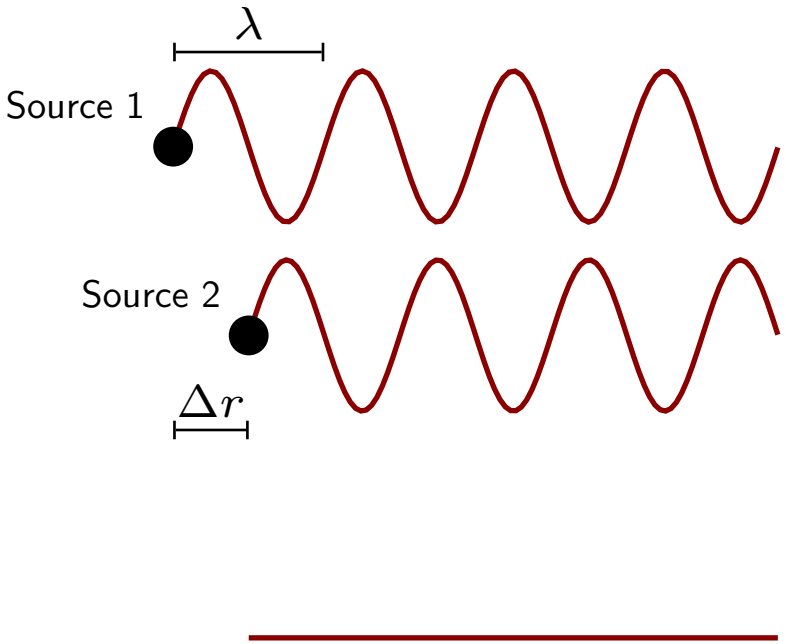


Sources offset by two wavelengths.

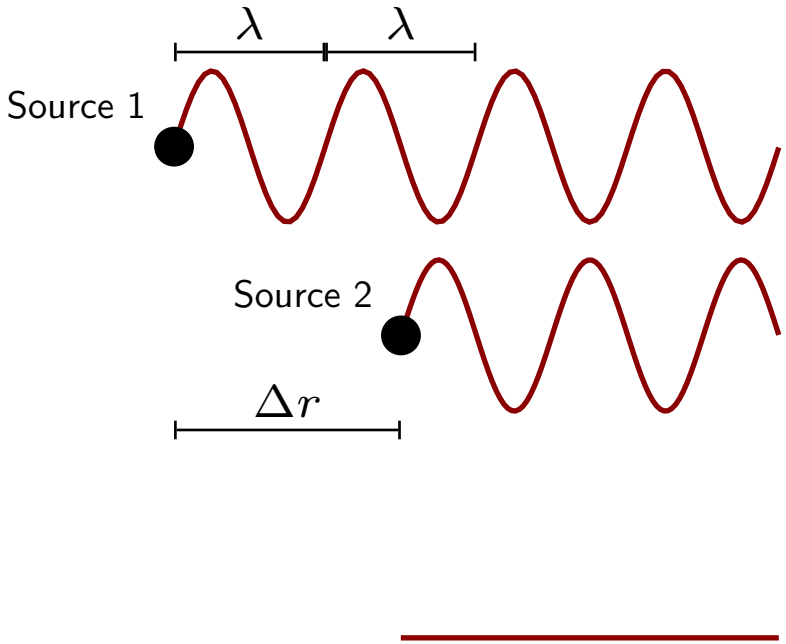


Waves from Two Sources: Destructive Interference

Sources offset by one half wavelength.

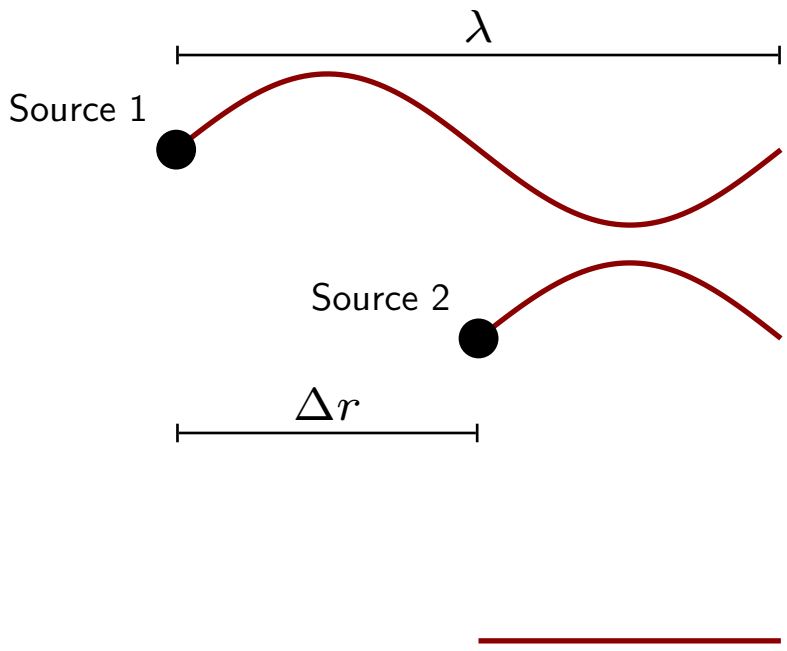


Sources offset by one and a half wavelengths.



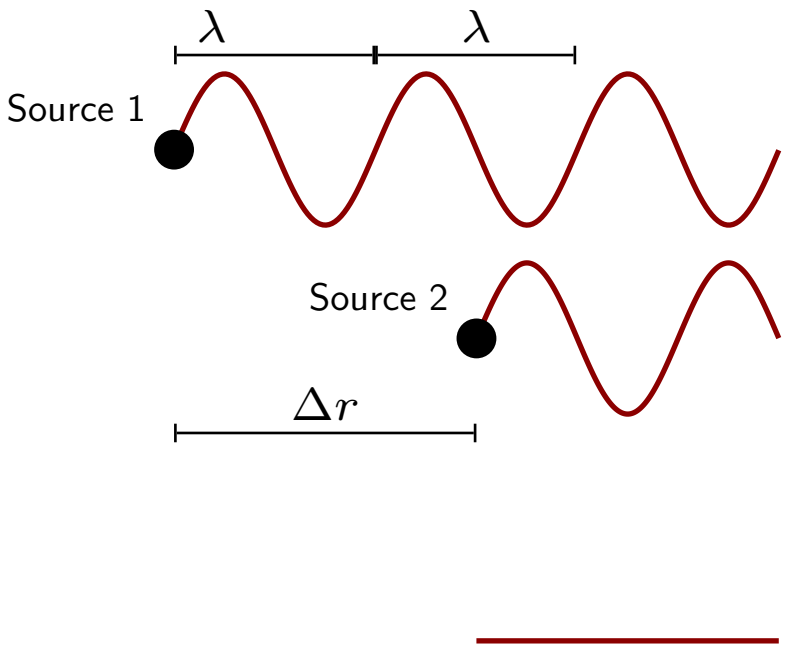
Waves from Two Sources: Destructive Interference

Sources offset by half wavelength.



Superposition

Sources offset by one and a half wavelengths.

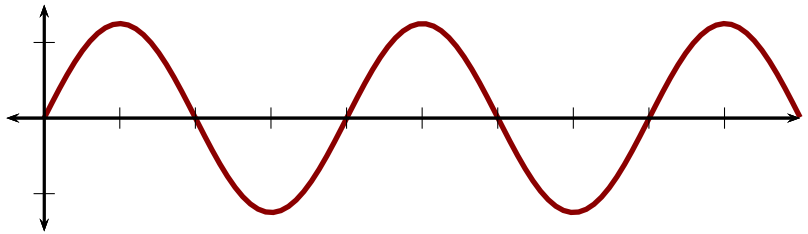


Superposition

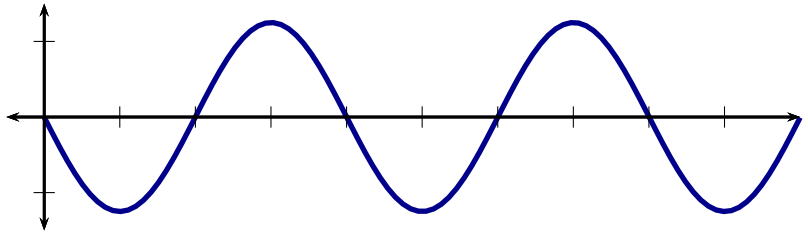
Question 3

Snapshots of two waves in the same medium are as illustrated.

Wave 1



Wave 2



By what distance is wave 2 shifted from wave 1?

1. 4λ
2. 2λ
3. λ
4. $\frac{\lambda}{2}$
5. $\frac{\lambda}{4}$

Overlapping Waves from a Double Slit