## **Interference of Pulses**

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







### **Interference of Pulses**



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?



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  $\Delta \phi = 0$ .





## **General Interference II**

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





## **General Interference III**

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





### **General Interference IV**

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





# **General Interference V**

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





# **Constructive Interference**

Snapshots of two waves at one 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.





### Waves from Two Sources

Sources coincide. Constructive interference results.



Sources offset by one wavelength. Constructive interference results.



#### Waves from Two Sources

Sources offset by two wavelengths. Constructive interference results.



Sources offset by two wavelengths. Constructive interference results.



### Waves from Two Sources

Sources offset by a half wavelength. Destructive interference results.



Sources offset by one and a half wavelengths. Destructive interference results.





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



By what distance is wave 2 shifted from wave 1?



2.  $2\lambda$ 

3.  $\lambda$ 

4.

5.

 $\frac{\lambda}{2}$ 

 $\frac{\lambda}{4}$ 

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





By what distance is wave 2 shifted from wave 1?



 $\frac{\lambda}{2}$ 

 $\frac{\lambda}{4}$ 

4.

5.