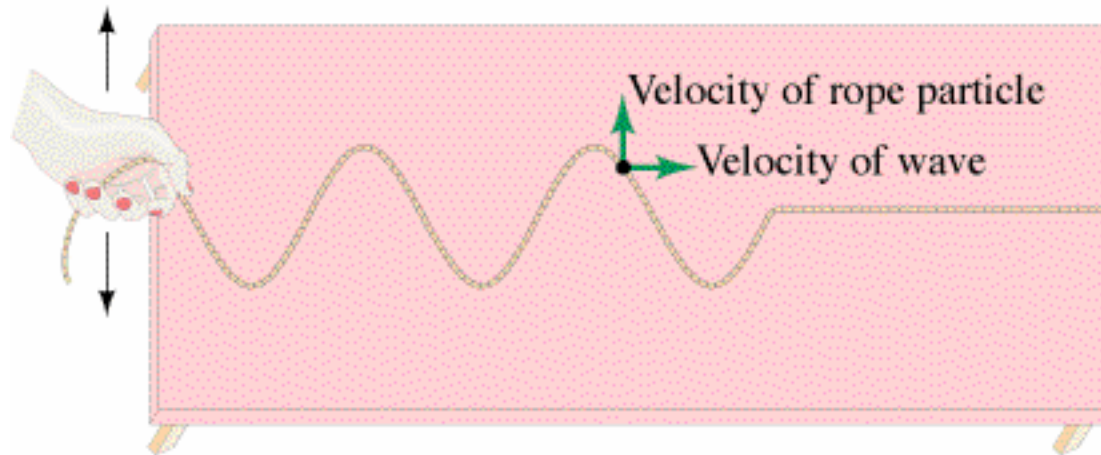


## 11-7. Wave Motion

Wave velocity vs. particle velocity

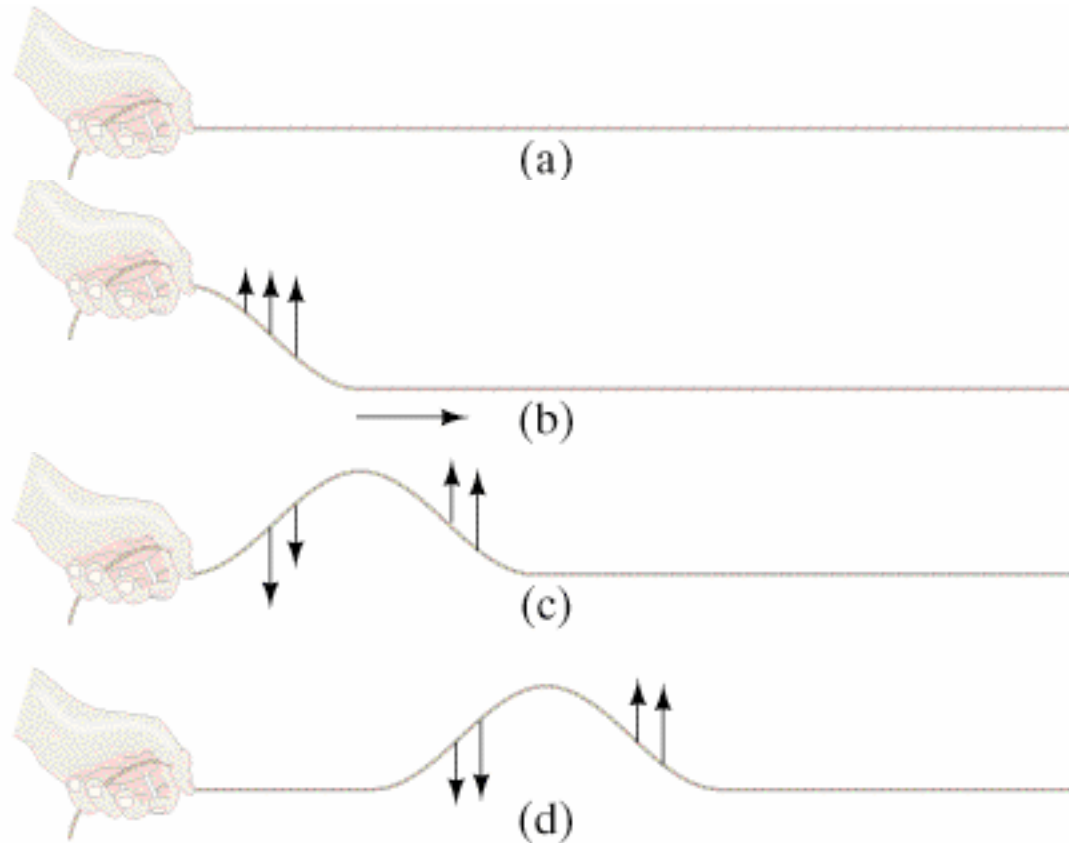


Wave can travel

Medium has only limited motion

**Waves are moving oscillations not carrying matter along**

# Wave Pulse



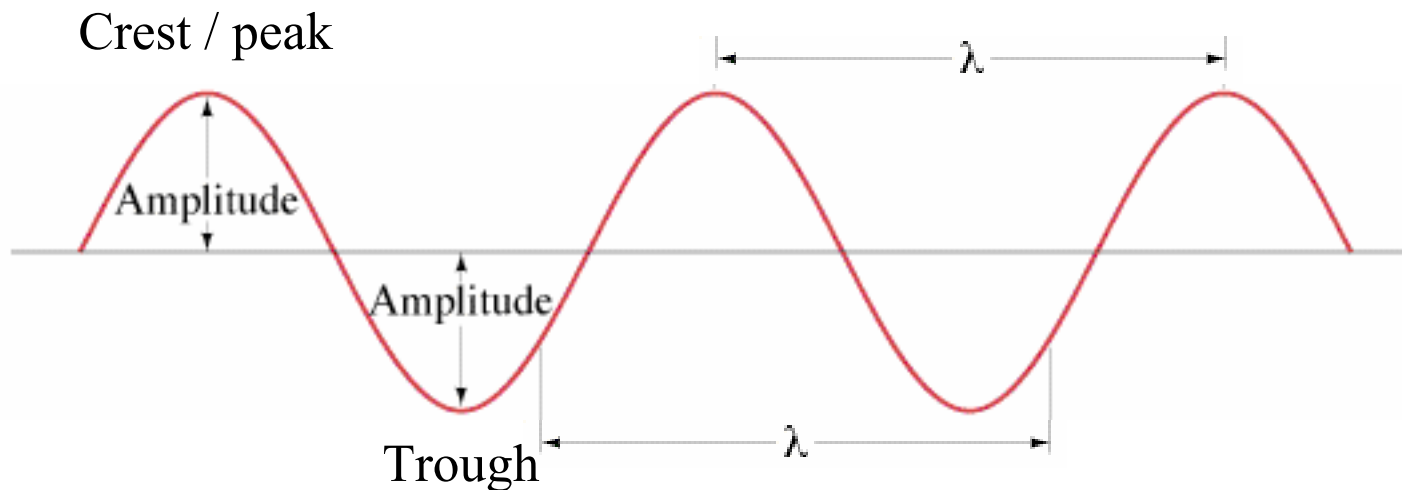
Source: disturbance + cohesive force between adjacent pieces

**A wave is a disturbance that propagates through space**

# Continuous / Periodic Wave

Caused by continuous/periodic disturbance: oscillations

## Characteristics of a single-frequency continuous wave



- Wavelength: distance between two successive crests  
or **any** two successive identical points on the wave
- Frequency  $f$ : # of complete cycles that pass a given point per unit time
- Period  $T$ :  $1/f$

# Wave Velocity

$$v = \lambda/T = \lambda f$$

Different from particle velocity

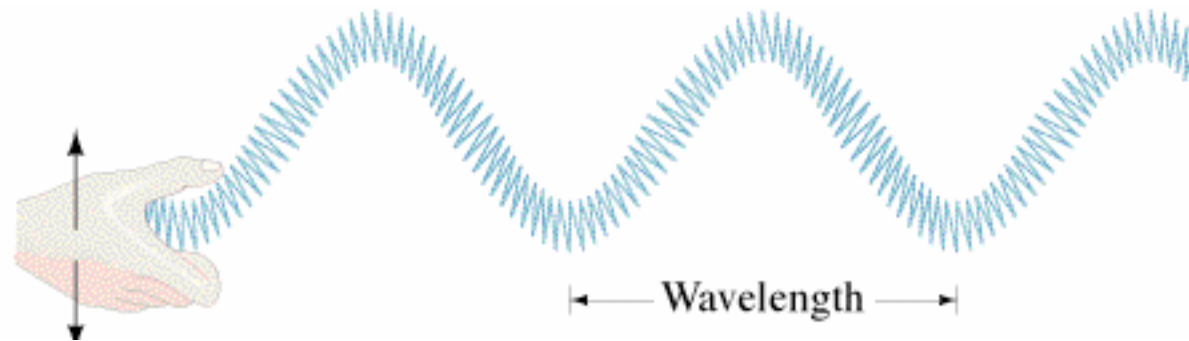
Depends on the medium in which the wave travels

$$v = \sqrt{\frac{F_T}{m/L}}, \text{ velocity on a string}$$

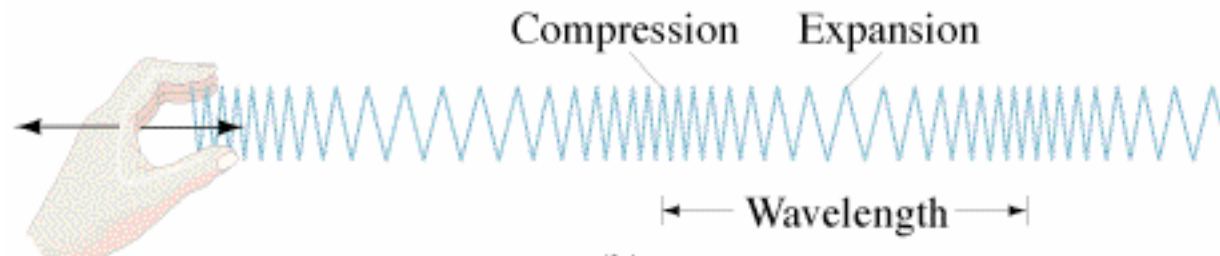
$F_T$ : tension in string, N

## 11-8. Types of Waves

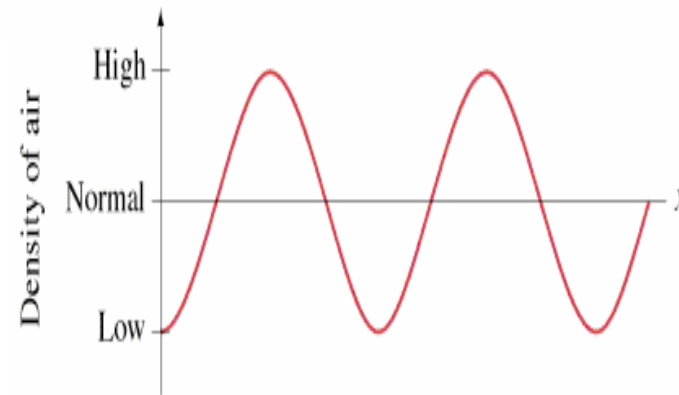
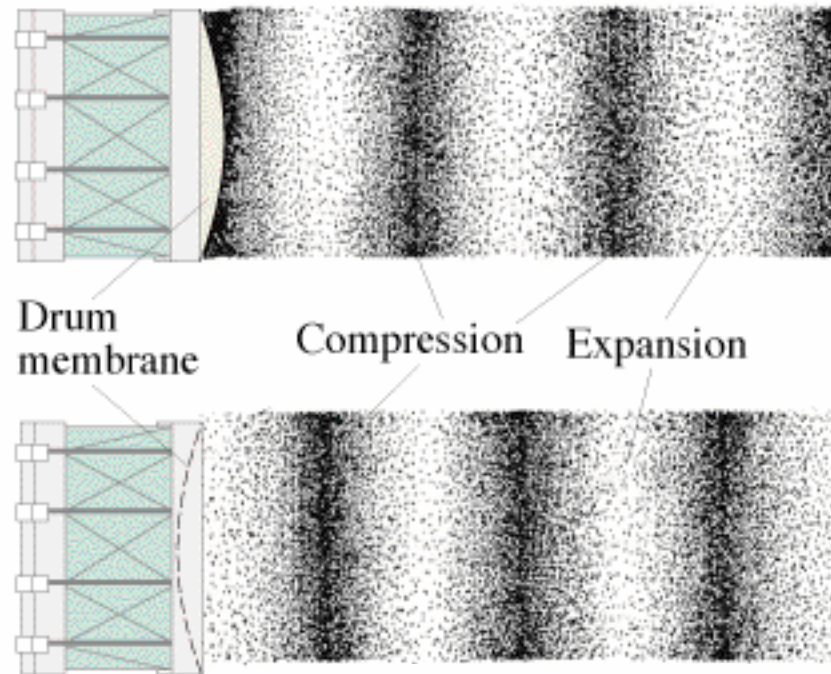
Transverse wave



Longitudinal wave



# Sound Wave: Longitudinal

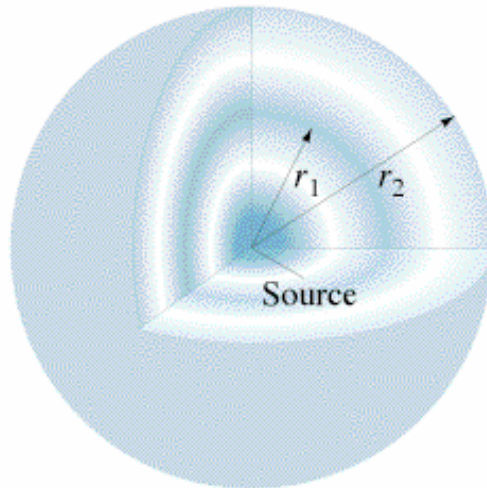


## 11-9. Energy Transported by Wave

Sinusoidal wave  $E = kA^2/2$

$$\text{Intensity } I = \frac{\text{energy/time}}{\text{area}} = \frac{\text{power}}{\text{area}} \propto A^2$$

Point source, isotropic medium - Spherical Wave

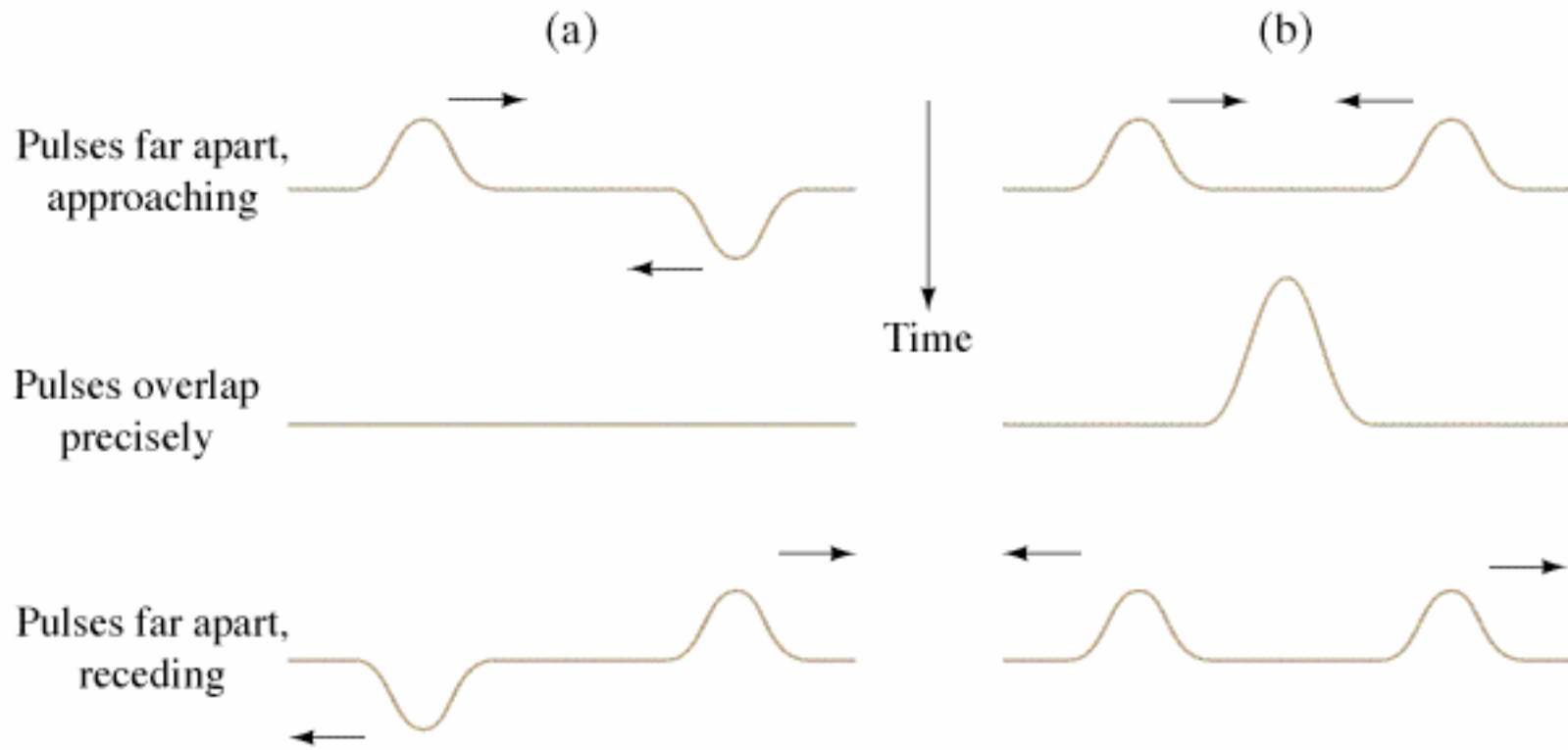


$$I = \frac{P}{4\pi r^2}$$

---

# 11-11. Interference

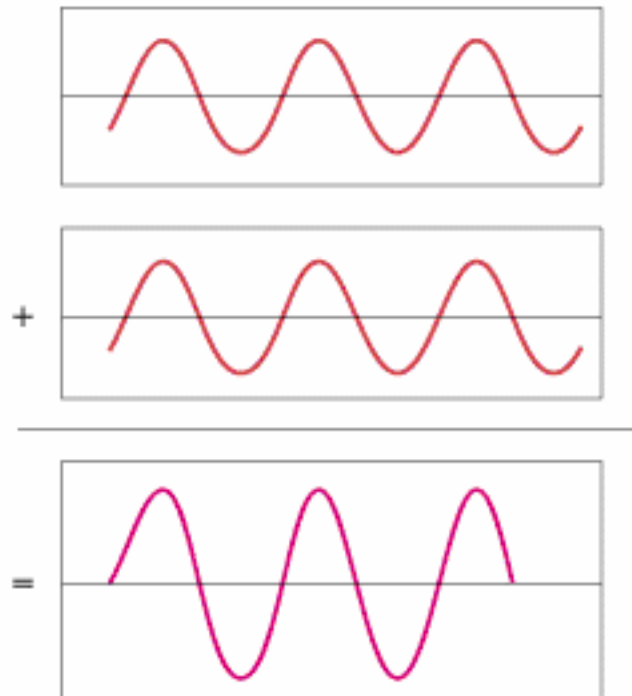
## Principle of superposition



Destructive Interference

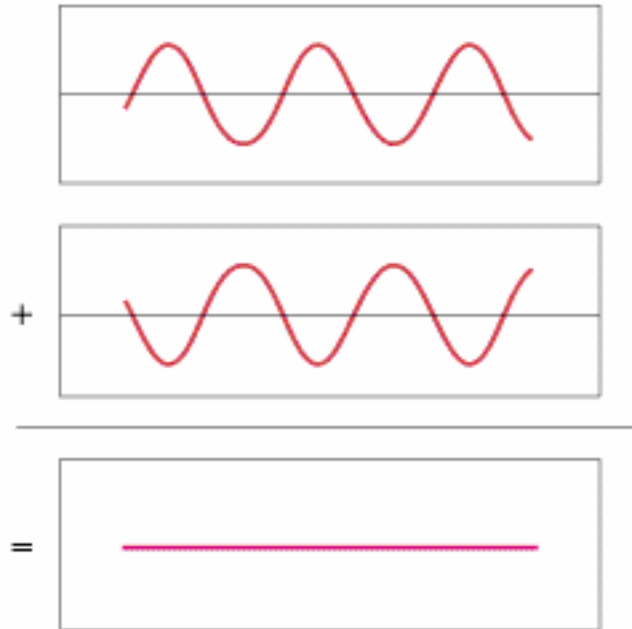
Constructive Interference

# Constructive



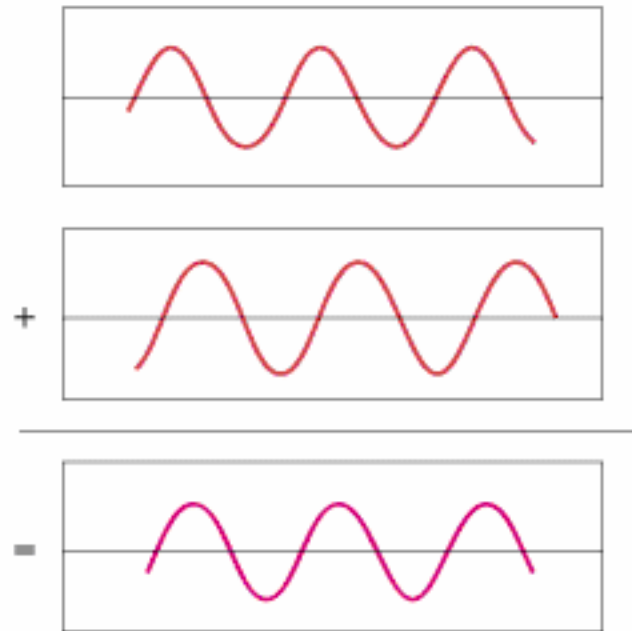
In Phase

# Destructive



Completely out of phase

# Partially Destructive



Out of phase