**Announcements**

Exam IV -> 11/21/03
Final Exam 12/09/03
2:00pm

**Traveling waves**

Transverse waves:
The particles of the disturbed medium move perpendicular to the wave motion.

Longitudinal waves:
The particles of the disturbed medium move parallel to the wave motion.
One-dimensional traveling waves
Consider a pulse moving down a rope.
The pulse moves at a speed $v$.
$\Rightarrow$ The displacement $y$ is a function of $x$ and the time $t$.

If wave travels to the left:
$$y = f(x + vt)$$
If wave travels to the right:
$$y = f(x - vt)$$

Quiz
A wave pulse is moving, as illustrated, with uniform speed $v$ along a rope. Which of the graphs 1–4 below correctly shows the relation between the displacement $y$ of point $P$ and time $t$?

Sinusoidal waves
The function describing a traveling sinusoidal wave:
$$y = A\sin\left[\frac{2\pi}{\lambda}(x - vt)\right]$$
**Sinusoidal waves**

\[ y = A \sin \left( \frac{2\pi}{\lambda} (x - vt) \right) \]

\[ y = A \sin (kx - \omega t) \]

Velocity of wave: \[ v = \frac{\lambda}{T} = f \cdot \lambda \]

Angular wave number: \[ k = \frac{2\pi}{\lambda} \]

Angular frequency: \[ \omega = \frac{2\pi}{T} \]

**Speed of waves on a string**

Transverse wave:

\[ v = \sqrt{\frac{T}{\mu}} \]

Where:

- \( T \) : tension in rope (don’t confuse with period \( T \))
- \( \mu \) : mass per unit length of rope

**Reflection of a traveling wave on a rigid wall**

- If a wave encounters a “denser”, new medium, or a rigid wall, it gets reflected.
- In this case, the reflected pulse is inverted upon reflection.
Reflection of a traveling wave on a loose end

- If a wave encounters a "less dense" medium or an end it also gets reflected.
- In this case the reflected pulse is not inverted upon reflection.

Transmission: Light string \(\rightarrow\) heavier string

The transmitted pulse is not inverted.
The reflected pulse is inverted.

Transmission: Heavy string \(\rightarrow\) light string

The transmitted pulse is not inverted.
The reflected pulse is not inverted.
A wave pulse travels from medium A to medium B:
If $v_A > v_B$ (B is denser than A) the pulse is inverted upon reflection
If $v_A < v_B$ (A is denser than B) the pulse is not inverted upon reflection