Section Summary

13.1 Types of Waves

- A wave is a disturbance that moves from the point of creation and carries energy but not mass.
- Mechanical waves must travel through a medium.
- Sound waves, water waves, and earthquake waves are all examples of mechanical waves.
- Light is not a mechanical wave since it can travel through a vacuum.
- A periodic wave is a wave that repeats for several cycles, whereas a pulse wave has only one crest or a few crests and is associated with a sudden disturbance.
- Periodic waves are associated with simple harmonic motion.
- A transverse wave has a disturbance perpendicular to its direction of propagation, whereas a longitudinal wave has a disturbance parallel to its direction of propagation.

13.2 Wave Properties: Speed, Amplitude, Frequency, and Period

- A wave is a disturbance that moves from the point of creation at a wave velocity v_{w}.
- A wave has a wavelength λ, which is the distance between adjacent identical parts of the wave.
- The wave velocity and the wavelength are related to the wave's frequency and period by $v_{\text{w}} = \frac{\lambda}{T}$ or $v_{\text{w}} = f\lambda$.
- The time for one complete wave cycle is the period T.
- The number of waves per unit time is the frequency f.
- The wave frequency and the period are inversely related to one another.

13.3 Wave Interaction: Superposition and Interference

- Superposition is the combination of two waves at the same location.
- Constructive interference occurs when two identical waves are superimposed exactly in phase.
- Destructive interference occurs when two identical waves are superimposed exactly out of phase.
- A standing wave is a wave produced by the superposition of two waves. It varies in amplitude but does not propagate.
- The nodes are the points where there is no motion in standing waves.
- An antinode is the location of maximum amplitude of a standing wave.
- Reflection causes a wave to change direction.
- Inversion occurs when a wave reflects from a fixed end.
- Refraction causes a wave's path to bend and occurs when a wave passes from one medium into another medium with a different density.