Waves, Vibrations + Simple Harmonic Motion (SHM)

— waves, spring, pendulums, etc.

- periodic motion

Restoring force is directly proportional to the displacement

Key terms, → period, frequency, amplitude, energy, wave speed, wavelength, ...

- Ch 14 from our book

- Springs
  - Hookes Law

$F = -kx$, where x is the displacement from equilibrium, and k is your spring constant specific for each spring.

(There are slight variations in k w/ temp + Press)

$U_s = P.E_{spring} = \frac{1}{2}kx^2$

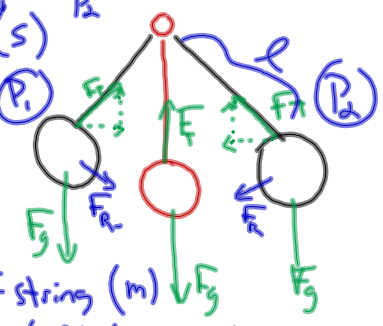
Essentially "Rest" equilibrium as well as max velocity pt.

Time from $P_1 \rightarrow P_2$ ↑ Period (s)

$P_1 \leftarrow P_2$

Pendulums

$T = 2\pi\sqrt{\frac{l}{g}}$



l = length of string (m)

g = gravity (9.81 m/s² for earth)

Resonance

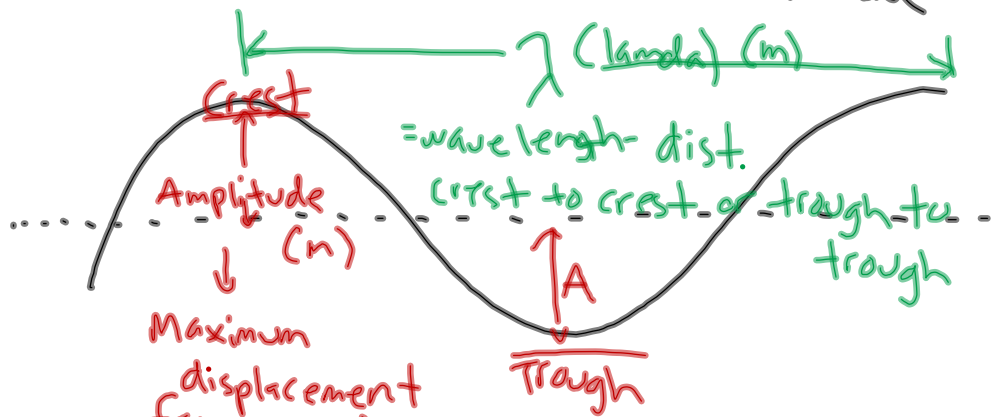
Small forces applied at regular periodic intervals to increase the energy or amplitude of a wave or vibration

(Tacoma Narrows Bridge)

Waves –

A disturbance that carries energy through space or matter.

Basic Characteristics of a wave



Maximum displacement from equilibrium.
- Measured at the crest or trough.

Time to travel 1 wavelength = Period = T (s)

frequency = "How often waves occur"
= or "How many waves per time"

$$f = \frac{1}{T} = \text{cycles/sec} = \text{Hertz (Hz)}$$

6 sec = 1 wave ⇒ 1/6 wave/sec

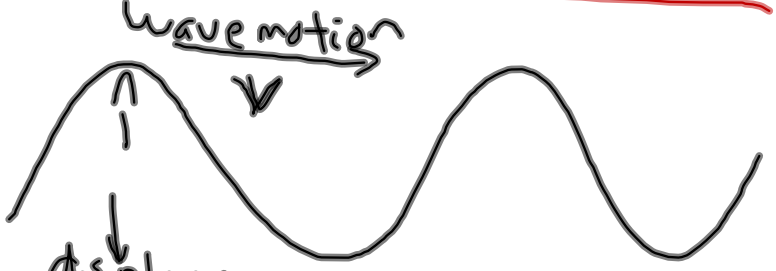
$$v = \text{wave speed} = \frac{\Delta d}{\Delta t} = \frac{\lambda}{T} = \lambda f$$

Types of Mechanical Waves

Longitudinal - → wave motion or v

→ Parallel to displacement

Transverse -



Surface - have characteristics of Both longitudinal + transverse waves

- Ocean waves