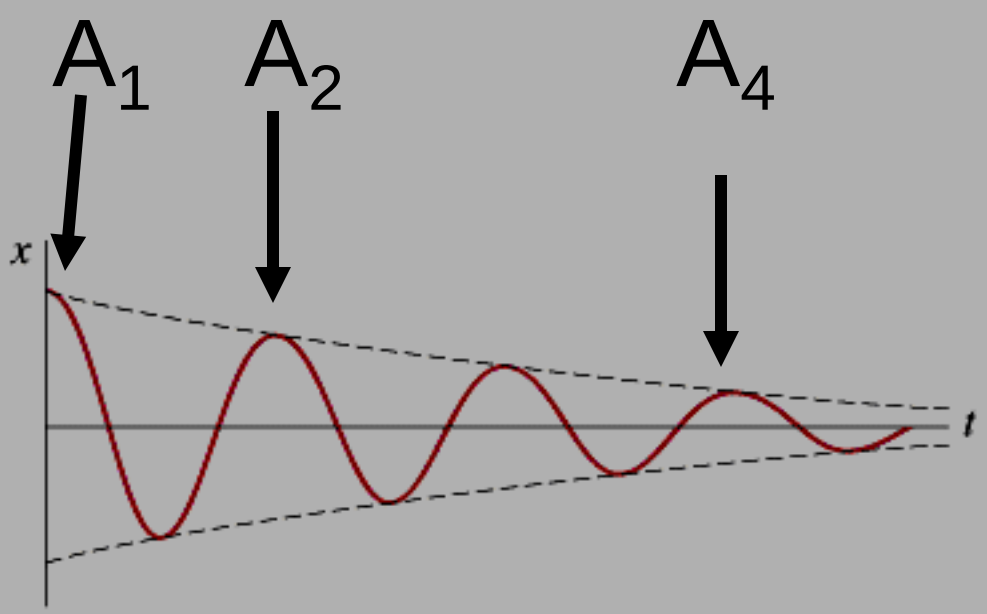
Damped Harmonic Motion

- Notice that in all cases we ignored friction or any other mechanism that dissipates energy from a system.
  - If energy is dissipated (lost) when a mass is oscillating on a spring, its amplitude decreases with time.
  - We call this **damped harmonic motion**.
- Damped systems are categorized by the size of the damping force.

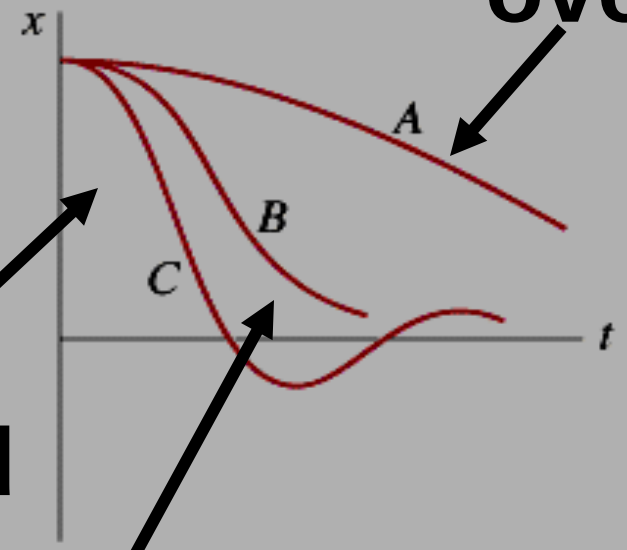
Damped Harmonic Motion



This is what happens when an oscillator is damped. This system is *underdamped*.

Damped Harmonic Motion

overdamped

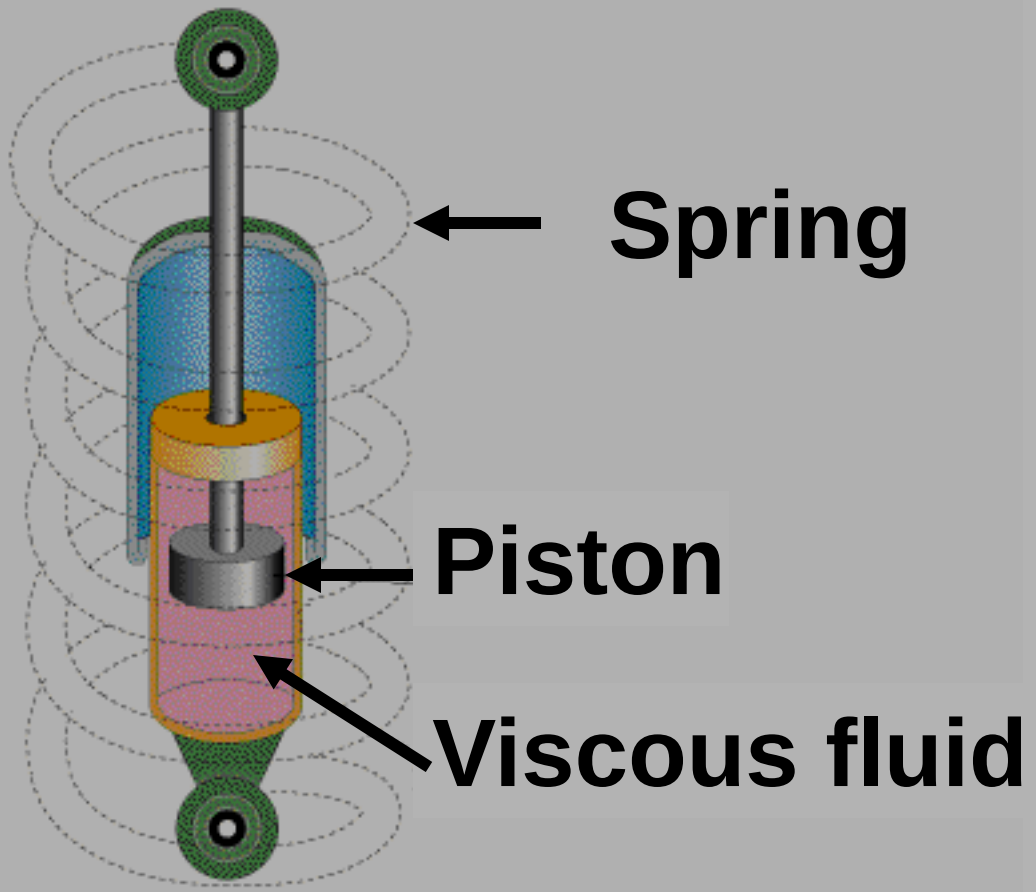


underdamped

critically damped, reaches equilibrium in shortest possible time.

Damped Harmonic Motion-Example

Upon hitting a bump, the motion of spring is restricted because the piston moves through a fluid that damps the motion of the piston



Driven Harmonic Motion

- Suppose we apply a time dependent force to drive a spring in oscillation.
  - If the frequency of the force you apply is the same as the natural frequency of oscillation of the spring, the vibrations will become larger and larger. Damping limits the maximum amplitude of oscillation that can be achieved. This is called a **resonance**. All system that are driven into harmonic motion are called **driven harmonic** systems.

- **Can you think of examples of damped harmonic motion?**
- **Can you think of examples of driven harmonic motion?**