

## Recitation 3

In this recitation, we will look at:

- Review:
  - First Law: Conservation of Energy
  - Types of Systems
  - Types of Processes
  - Internal Energy of a Thermodynamic System
  - Types of Work
- Questions regarding homework
- Sample Problems:

### Problem 1

A gas is confined in a cylinder by a piston. The initial pressure of the piston is 2 atm, and the volume is  $1\text{m}^3$ . The piston is held in place by latches in the cylinder wall. Now, we place the apparatus in total vacuum.

1. What is the energy change of the apparatus if the retaining latches are removed so that the gas suddenly expands to double its initial volume? The piston is again held by latches at the end of the process.
2. What can you say if the same process is carried out in the atmosphere? Assume that the heat transfer rate is much slower than the rate at which the process occurs.

### Problem 2

Identify what is wrong with the following assertions:

- The internal energy change undergone by an adiabatic system is always proportional to the heat released by it, provided no work is performed on the system at the same time.
- When an ideal gas inside a piston increases its temperature at constant volume, the work done by it is numerically equal to the increase in its internal energy.
- When a horse is adiabatically lifted against a gravitational field, the work done during the process constitutes a state function.