

### Fluid Mechanics Assignment 1

1. A compressed air tank has a volume of  $5 \text{ m}^3$ . When the tank is filled with air at a pressure of 4 atmospheres above atmospheric pressure, determine the density of the air and the mass of air in the tank. Assume the temperature is  $25^\circ\text{C}$ .
2. Consider a gas of helium initially occupying a 1 liter volume at 1 atmospheric pressure. Find the final pressure if it is compressed to 0.5 liter for
  - a) Isothermal compression
  - b) Adiabatic compression
3. Find the diameter of a capillary tube so the rise of water due to surface tension at  $20^\circ\text{C}$  is less than 1 mm.
4. The CN tower rises to a height of approximately 550 meters. Estimate the ratio of the pressure at the top of the building to the pressure at its base, assuming the air to be at a common temperature of a)  $25^\circ\text{C}$  in summer and b)  $-10^\circ\text{C}$  in winter.
5. Plot the variation of the temperature as a function of height in the atmosphere. You may look up the "standard atmosphere". Explain the graph.