CHE290 Programming for Chemical Engineers
Day 2 Practice Problem Statements

1. The temperature change for an adiabatic compression is:

$$T = T_0\left(\frac{P}{P_0}\right)^{\frac{\gamma-1}{\gamma}}$$

The work that is necessary to perform compression is a function of the temperature of the air as shown below.

$$W = m_{air}C_p\left(T - T_0\right)$$

In the equations above T represents the actual temperature, T_0 represents the initial temperature, P represents the actual pressure, P_0 represents the initial pressure, m_{air} represents the mass of air, C_P represents the heat capacity of the air and is a constant, while γ represents a ratio of heat capacities and is also a constant.

P_0 = 1 atm
T_0 = 350 K
γ = 1.4
C_P = 1.021 kJ/kg*K
m_{air} = 4.5 kg

2. The vapor pressure for a substance is often determined from the Antoine equation, which takes the form:

$$\log_{10} P^{vap} = A - \frac{B}{T + C}$$

where the temperature (T) is in ^oC and the vapor pressure is in *torr*.

The Antoine constants for water are:

$$A = 8.05573$$
$$B = 1723.64$$
$$C = 233.076$$