ASSIGNMENT 2

3.3-3 A system obeys the equations

and

Find the fundamental equation.

Hints: To integrate, let

Where D, n, and m are constants to be determined.

3.4-2 show that the relation between the volume and the pressure of a monoatomic ideal gas undergoing a quasi-static adiabatic compression () is

= constant

Sketch a family of such “adiabats” in a graph of versus . Find the corresponding relation for a simple ideal gas.

3.4-5 In a particular engine a gas is compressed in the initial stroke of the piston. Measurements of the instantaneous temperature, carried out during the compression, revel that temperature increases according to

Where and are the initial temperature and volume, and is a constant. The gas is compressed to the volume (where . Assume the gas to be monatomic ideal, and assume the process to be quasi-static.

1. Calculate the workW done on the gas.
2. Calculate the change in energy of the gas.
3. Calculate the heat transfer to the gas (through the cylinder walls) by using the results of (a) and (b).
4. Calculate the heat transfer directly by integrating
5. From the result of or ,for what value of η is Show that the value of η the locus traversed coincides with an adiabat (as calculated in problem 3.4-2).

3.4-11 show that the pressure of a multicomponent simple ideal gas can be written as the sum of “partial pressures” where These “partial pressure” are purely formal quantities not subject to experimental observations. (From the mechanistic viewpoint of kinetic theory the partial pressure is the contribution to the total pressure that results from bombardment of the wall by molecules of species -a distinction that can be made only when the molecules are noninteracting, as in an ideal gas.)

3.5-1(c) Are each of the listed pairs of the equations of state compatible (recall equation 3.46)? if so, find the fundamental equation of the system.

c)

5.3-1 Find the fundamental equation of a monatomic ideal gas in the Helmholtz representation, in the enthalpy representation, and in the Gibbs representation. Assume the fundamental equation computed in Section 3.4. In each case find the equations of state by differentiation of the fundamental equation.