

2.1

In a certain system the internal energy U is related to the entropy S , particle number N , and the volume V through the relation

$$U = C N (N/V)^d \exp [d S/Nk_B],$$

Where C and d are constants.

- (a) Show that the system satisfies the ideal gas law independently of the value of d
- (b) Find the coefficient γ in the adiabatic equation $PV^\gamma = \text{constant}$, and the molar specific heats C_P and C_V of the system.

2.2

What is the boiling point of water on Mt. Evans, Colorado, where the atmospheric pressure is two-thirds that at sea level (pressure = 1 atm)?

Water data at boiling point under 1 atm.

$$T = 373\text{K}; \text{ Latent heat} = 539 \text{ cal/g}; v_{\text{liquid}} = 1 \text{ cm}^3 (1\text{g}); v_{\text{gas}} = 1671 \text{ cm}^3 (1\text{g}).$$

2.3

Show that the heat capacity at constant volume C_V of a Van der Waals gas is a function of the temperature alone.

2.4

Problem 2.2 of Huang (Clapeyron equation for a second order transition)