Physics 301: Problems #4
September 11, 2020

1. For quasistatic isothermal expansion of ideal monatomic gas, prove that $\Delta S = \frac{Q}{T}$. In the case of free expansion, what is ΔS ?

2. The Sackur-Tetrode equation is , $S = Nk \ln[\ ]$ where

$$[\ ] = e^{5/2} \frac{V}{N} \left(\frac{4\pi m U}{3Nh^2} \right)^{3/2}$$

   One mole of an ideal gas has an entropy of $S = 15.2R$. What would be the entropy of one mole of a gas of distinguishable particles?

3. Two volumes of gases are at the same temperature, separated by a partition. The volumes and molecule numbers are V_a, V_b and N_a, N_b. If the partition is removed and the gases mixed, by how much does the entropy of the system increase?