1. A volume of gas at standard temperature and pressure undergoes an isothermal expansion to twice the initial volume, i.e. $V_i \rightarrow V_f = 2V_i$.
   a. How much heat must flow into the gas to keep the process isothermal?

b. The Sackur-Tetrode form for the entropy of an ideal gas is

$$S(N, V, U) = Nk \left( \frac{5}{2} + \ln \left[ \frac{V}{N \left( \frac{4\pi mU}{3\hbar^2 N} \right)^{\frac{3}{2}} } \right] \right).$$  \hspace{1cm} (1)

What is the change in the Sackur-Tetrode entropy when a volume of gas undergoes an isothermal expansion to twice the initial volume?