Exercise 7-5

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ideal gas

$n = 1\ \text{mol}$

S is a statevariable ; we calculate the change in S by going over a reversible isothermal path

$$dU = TdS - pdV$$

for an ideal gas $U = U(T)$ and because $dT = 0$,

$$dU = 0$$

$$TdS = pdV$$

$$dS = \frac{nR}{V}dV$$

$$\Delta S_{system} = nR \ln\left(\frac{V_f}{V_i}\right) = \ln(3)\, nR$$

$$= 8.314 \cdot 10^{3}\ \text{J}\,\text{kmol}^{-1}\text{K}^{-1} \cdot 1\ \text{kmol} \cdot \ln(3)$$

$$= 9134\ \text{J}$$

$$\Delta S_{universe} = \Delta S_{system}$$

(because the system is adiabatically enclosed)