Homework #9:

5-10:

a): $Q_{in} = \Delta U + W_{out}$

$= \int p dV$

$= \int p d\left(\frac{nRT}{p}\right)$

$= nRT \cdot (-1) \int_{p_1}^{p_2} \frac{1}{p} dp$

$= nRT(-1) \cdot \ln \frac{p_2}{p_1}$

$= \frac{3}{32} \cdot 8.314 \cdot (273.15+80) \cdot \ln \frac{250}{110}$

$= 225.98\ KJ$

b): $Q_{in} = 225.98 * 0.85 = 192.08\ KJ$

5-17:

a): $Q_{add} = W_{out}$

$= \int_{V_1}^{V_2} p dV = \int_{V_1}^{V_2} \frac{nRT}{V} dV = nRT \ln \frac{V_2}{V_1}$

$= \frac{P_1 V_1}{RT} \cdot RT \ln \frac{V_2}{V_1}$

$= 500 \cdot 0.05 \ln \frac{0.1}{0.05} = 17.33 KJ$

b): $\frac{Q_H}{T_H} + \frac{Q_L}{T_L} = 0 \Rightarrow Q_L = -\frac{Q_H}{T_H} \cdot T_L = -17.33 \cdot \frac{273.15}{273.15+90}$

$= -13.03\ kJ$