
Example

A closed system undergoes a thermodynamic cycle consisting of the following processes:

Process 1-2: *adiabatic* compression with $PV^{1.4} = \text{constant}$ from $P_1 = 50 \text{ lbf/in}^2$, $V_1 = 3 \text{ ft}^3$ to $V_2 = 1 \text{ ft}^3$.

Process 2-3: constant volume

Process 3-1: constant pressure, $U_1 - U_3 = 46.7 \text{ Btu}$.

Ignoring kinetic and potential energy effects,

- sketch the P - V diagram for the cycle,
- find the work and heat transfer for each process in Btu, and
- find the *net* work and heat transfer for the cycle.
- Is this a heat engine or a refrigerator/heat pump? Find the appropriate *MOP*(s) for your answer.

Process	ΔU	Q	W
1-2			
2-3			
3-1			
cycle			

Note: 1 Btu = 778 ft-lbf