Recitation 10

Name: _

A monatomic gas undergoes the following cycle: a) isothermal compression until its volume is halved, b) isobaric expansion until its volume is restored to the initial value V_1, c) isochoric cooling until its pressure is restored to the initial value P_1.

- Draw this cycle and clearly label the three corners 1, 2, and 3.
- Find P_2 in terms of P_1 and T_3 in terms of T_1. *positive, negative or*
- For each process, identify which of the following is zero: dE, Q, W_s.
- For each process, write an expression for W in terms of the state variables.
- ~~For each process, write an expression for Q (use $Q = W$ for one step) and identify whether each Q is positive or negative.~~
- Express each W and Q in terms of n, T, and numerical values/constants. If done correctly, the net work for the cycle (sum of the three Ws) should equal the net heat (sum of the three Qs). Show that this is true.

The heat engine shown in the figure uses 2.0 mol of a monatomic gas as the working substance.

a) Determine T_1, T_2, and T_3.
b) Make a table that shows ΔE_{th}, W_S, and Q for each of the three processes.
c) What is the engine's thermal efficiency?
d) How do you know this is a heat engine and not a heat pump?