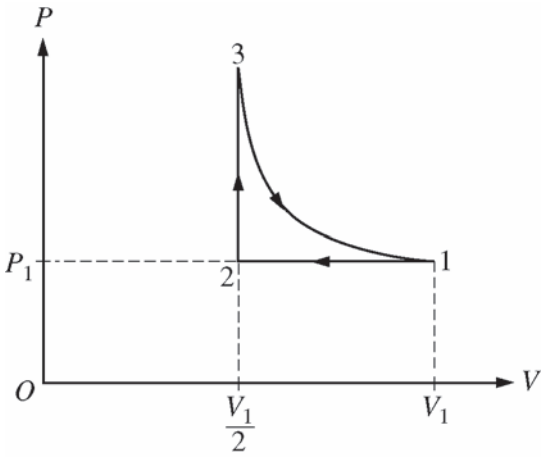

5. (10 points)
A sample of n moles of an ideal gas, originally at a pressure P_1 and volume V_1, undergoes the three processes shown on the *PV* diagram above:

Process $1 \rightarrow 2$: The volume is halved while the pressure remains constant.
Process $2 \rightarrow 3$: The pressure is increased while the volume remains constant until the temperature reaches its original value.
Process $3 \rightarrow 1$: The volume is increased while the temperature remains constant until the volume reaches its original value.

(a) Determine expressions for each of the following in terms of P_1, V_1, n, and fundamental constants.

i. The temperature of the gas in state 1

ii. The pressure of the gas in state 3

iii. The total work done <u>on</u> the gas during processes $1 \rightarrow 2$ and $2 \rightarrow 3$

(b) Indicate below whether heat is added to the gas, removed from the gas, or neither during the process $2 \rightarrow 3$.

____ Added to ____ Removed from ____ Neither added to nor removed from

Justify your answer.

(c) Indicate below whether heat is added to the gas, removed from the gas, or neither during the process $3 \rightarrow 1$.

____ Added to ____ Removed from ____ Neither added to nor removed from

Justify your answer.

GO ON TO THE NEXT PAGE.