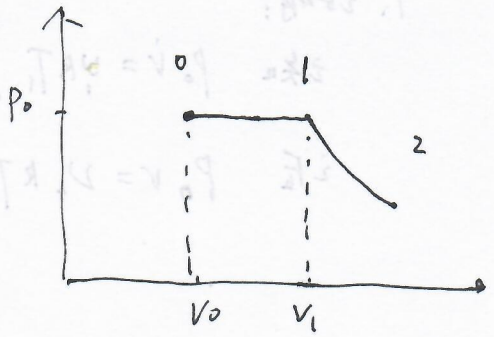
5. 解：如图，根据理想气体




$$\frac{P_0V_0}{T_0} = \frac{P_1V_1}{T_1},$$

$P_1 = P_0$, $T_1 = 450\,k$, $V_1 = \frac{T_1}{T_0}V_0 = \frac{3}{2} \times V_0$

$= 6\times10^{-3}\,m^3$.

绝热过程内能改变量等于外界对系统的功，

$$W_1' = -\Delta U = \nu C_v (T_1 - T_2) = \nu \times \frac{5}{2}R(150) = 375\nu R.$$

整个过程的功.

$$W' = P_0(V_1 - V_0) + W_1'$$

$$= 1\times10^5 \times (2\times10^{-3}) + 375\nu R$$

$$= 2\times10^2 + 375\nu R$$

$$\nu R = \frac{1\times10^5 \times 4\times10^{-3}}{300} = \frac{4}{3},$$

$$W' = 2\times10^2 + 125\times4 = 700\,J$$