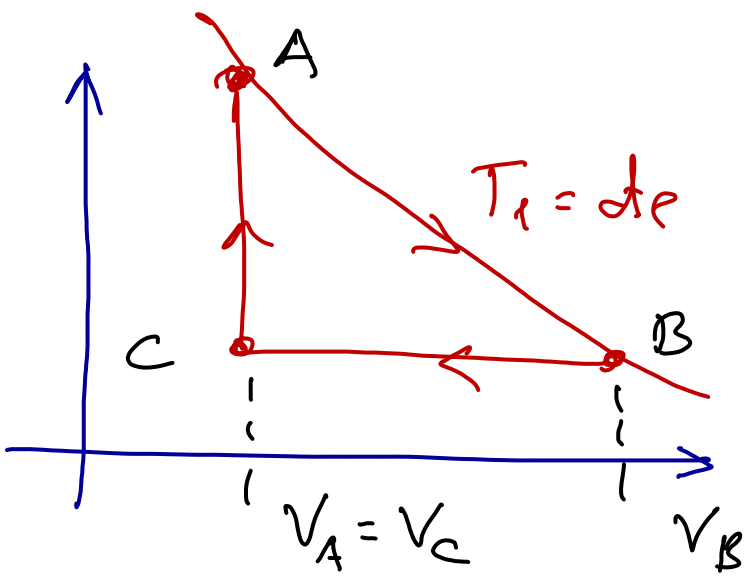
Prob: 1.5



AB: Isoterma $\Delta U_{AB} = 0$

$$W_{AB} = \int_{V_A}^{V_B} (-p)\, dV = \int_{V_A}^{V_B} -\frac{nRT_1}{V}\, dV$$

$$W_{AB} = -nRT_1 \operatorname{Ln}\left(\frac{V_B}{V_A}\right) = nRT_1 \operatorname{Ln}\left(\frac{V_A}{V_B}\right) < 0$$

$$Q_{AB} = -W_{AB} \qquad Q_{AB} = nRT_1 \operatorname{Ln}\left(\frac{V_B}{V_A}\right) > 0$$

BC: $p \equiv de$ $\quad Q_{BC} = \Delta H_{BC} = \frac{\gamma}{\gamma-1} nR(T_C - T_B)$

$$\frac{nRT_1}{V_B} = p_B = p_C = \frac{nRT_C}{V_C} \rightarrow \frac{T_1}{V_B} = \frac{T_C}{V_C}$$

$$T_C = T_1 \frac{V_C}{V_B} = T_1 \frac{V_A}{V_C} \qquad Q_{BC} = \frac{\gamma}{\gamma-1} nR\left(T_1 \frac{V_A}{V_B} - T_1\right)$$

$$Q_{BC} = \frac{\gamma}{\gamma-1} nRT_1 \left(\frac{V_A}{V_B} - 1\right) < 0 \qquad (V_B > V_A)$$

$$W_{BC} = \int_{V_B}^{V_C} (-p)\, dV = (-p_C)(V_C - V_B) = p_C (V_B - V_A) > 0$$

↖ p de

otro modo: $Q_{BC} = \Delta U_{BC} - W_{BC}$ y se obtiene lo mismo.

CA : $V = de \rightarrow W_{CA} = 0$ $\Delta U_{CA} = Q_{CA}$

$$Q_{CA} = \frac{nR}{\gamma - 1}(T_1 - T_C) = \frac{nR}{\gamma - 1}\left(T_1 - T_1 \frac{V_A}{V_B}\right)$$

$$Q_{CA} = \frac{nR}{\gamma - 1} T_1 \left(1 - \frac{V_A}{V_B}\right) > 0$$