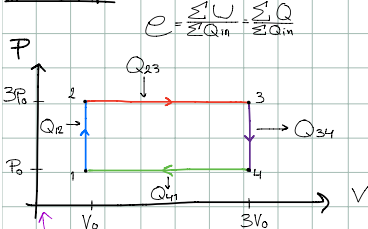


Effekt lunda

Recap



Tumregel: Nära origo \leftrightarrow låg temperatur

$$e = \frac{W_{12} + W_{41}}{Q_{12} + Q_{23}} = \frac{6P_0V_0 - 2P_0V_0}{nC_V(T_2 - T_1) + nC_P(T_3 - T_2)}$$

$$Q_{12} = nC_V(T_2 - T_1)$$

$$Q_{23} = nC_P(T_3 - T_2)$$

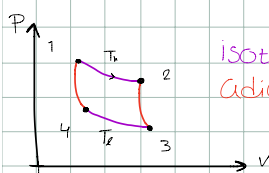
$$W_{23} = \int P dV = P \int dV = 3P_0(V_3 - V_2) = 3P_0(3V_0 - V_0) = 6P_0V_0$$

$$W_{41} = P_0(V_0 - 3V_0) = -2P_0V_0$$

$$\begin{aligned} T_2 &= 3T_1 & T_3 &= 9T_1 \\ T_3 &= 3T_2 \end{aligned}$$

$$\frac{6P_0V_0 - 2P_0V_0}{n \cdot \frac{5}{2}R(3T_1 - T_1) + n \cdot \frac{7}{2}R(9T_1 - 3T_1)} = \frac{4P_0V_0}{n \cdot \frac{5}{2}R2T_1 + n \cdot \frac{7}{2}R6T_1} = \frac{4nRT_1}{n \cdot \frac{5}{2}R2T_1 + n \cdot \frac{7}{2}R6T_1} = \frac{4}{3+15} = \frac{4}{18} = 0.22$$

CarnotProcess



isoterm: $W_{gas} = nRT \ln(\frac{V_2}{V_1})$

adiabat:

$$e = \frac{nRT_H \ln(\frac{V_2}{V_1}) + nRT_C \ln(\frac{V_4}{V_3})}{nRT_H \ln(\frac{V_2}{V_1})} =$$

$$P_1 V_1 = P_2 V_2$$

$$P_2 V_2^\gamma = P_3 V_3^\gamma$$

$$P_3 V_3 = P_4 V_4$$

$$\times P_4 V_4^\gamma = P_1 V_1^\gamma$$

$$V_1 V_2^\gamma V_3 V_4^\gamma = V_2 V_3^\gamma V_4 V_1^\gamma \Leftrightarrow (V_2 V_4)^\gamma = (V_1 V_3)^\gamma \Leftrightarrow V_2 V_4 = V_1 V_3 \Leftrightarrow \frac{V_4}{V_3} = \frac{V_1}{V_2} \Rightarrow \ln \frac{V_4}{V_3} = -\ln \frac{V_2}{V_1}$$

$$e = \frac{T_H \ln \frac{V_2}{V_1} + T_C (-\ln \frac{V_2}{V_1})}{T_H \ln \frac{V_2}{V_1}} = \frac{T_H - T_C}{T_H}$$

Värmeledning (Tänk på Kirchoff)

$$P = \frac{dQ}{dt} = k A \frac{T_H - T_C}{L}$$



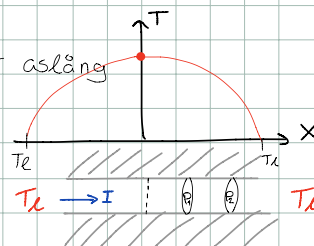
Värmeflöde genom tvåsnitts area



$$k_1 A \frac{T_H - T}{d_1} = k_2 A \frac{T - T_C}{d_2}$$

$$P = k A \text{grad}(T) = -k A \frac{dT}{dx}$$

Efter asläng
tid.



$$P_1 = -kA \left(\frac{dT}{dx} \right)_1$$

$$P_2 = -kA \left(\frac{dT}{dx} \right)_2$$

Ex

Enatomig gas: $C_V = \frac{3}{2}R$, $C_P = \frac{5}{2}R$

$$PV = nRT$$

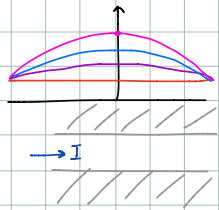
$$Q = \Delta E^{int} + W_{gas}$$

Q_{12} : Positiv ty temperaturen ökar.

Q_{23} : " " "

Q_{34} : Negativ, temp minskar

Q_{41} : " " "



✖ Efter 1 nanosekund.

Det alstras energi och ingen energi transporteras iväg, pga
avsaknaden av temperaturskillnaden (= 0)

✖ Temp stiger \Rightarrow energi börjar transporteras bort pga temp skillnaden

✖ Temp stiger mer \Rightarrow mer energi transporteras bort

✖ Vi når tillslut stationärt läge.