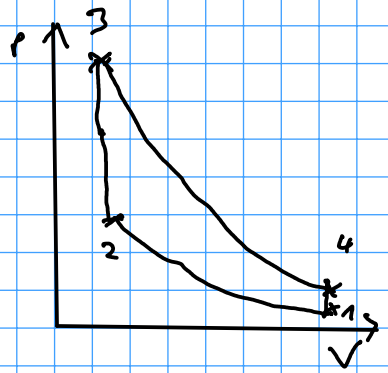

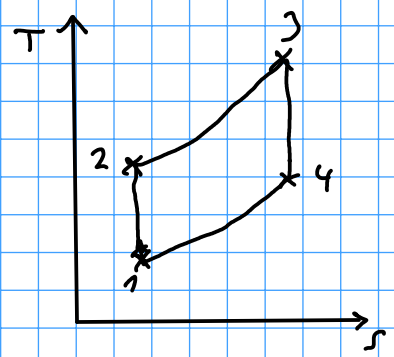

Verdichtungsverhältnis $\varepsilon := \frac{V_1}{V_2}$

Wirkungsgrad

$$\eta_{th} = \frac{\sum Q_i}{Q_{zu}} = \frac{Q_{23} + Q_{41}}{Q_{23}} = 1 + \frac{Q_{41}}{Q_{23}}$$

$$= 1 - \frac{T_4 - T_1}{T_3 - T_2} = 1 - \frac{\frac{T_3 T_1}{T_2} - T_1}{T_3 - T_2}$$

$$= 1 - \frac{T_3 T_1 - T_1 T_2}{T_2 (T_3 - T_2)}$$

$$= 1 - \frac{T_1}{T_2} = 1 - \frac{1}{\varepsilon^{\kappa-1}} = \eta_O$$

$Q_{23} = m c_V (T_3 - T_2)$

$Q_{41} = m c_V (T_1 - T_4)$

Isentrope $1 \to 2$

$$\frac{T_2}{T_1} = \left(\frac{V_1}{V_2}\right)^{\kappa-1} = \varepsilon^{\kappa-1}$$

Isentrope $3 \to 4$

$$\frac{T_4}{T_3} = \left(\frac{V_3}{V_4}\right)^{\kappa-1} = \left(\frac{V_2}{V_1}\right)^{\kappa-1} = \frac{T_1}{T_2} \quad \to T_4 = T_3 \frac{T_1}{T_2}$$