Recap 6.3: Carnot Cycle

Heat engine

\[ T_H \]

\[ Q_H \]

\[ Q_L \]

\[ T_L \]

Refrigeration cycle

\[ T_H \]

\[ Q_H \]

\[ Q_L \]

\[ T_L \]

Ideal cycle (no irreversibilities): Carnot cycle.

2 versions:

\[ P \]

\[ V \]

1 \( \rightarrow \) 2: Isothermal expansion
2 \( \rightarrow \) 3: Adiabatic expansion
3 \( \rightarrow \) 4: Isothermal compression
4 \( \rightarrow \) 1: Adiabatic compression

\[ W_{\text{net, out}} \]

\[ W_{\text{net, in}} \]

(Positive work)

(Negative work)

Carnot principles:

1. \( \eta_{\text{irre}} \leq \eta_{\text{net}} \)
2. All net heat engines operating between the same two reservoirs have the same \( \eta \).