MATH327: StatMech and Thermo, Spring 2026

Extra practice — ST diagrams

We covered this in a tutorial, but practicing it may be useful for those who missed that tutorial or want to check their understanding.

We have extensively used pressure–volume (PV) diagrams as a way to visualize and analyse thermodynamic processes and cycles, taking advantage of the fact that these two quantities suffice to describe the complete thermodynamic macro-state of an ideal gas. It is also possible to draw diagrams using different pairs of quantities, which in some cases can be more revealing. After PV diagrams, entropy–temperature (ST) diagrams are the next-most-common choice, with entropy on the horizontal axis and temperature on the vertical axis.

(a) Draw an isotherm and an adiabat on an ST diagram.

(b) The area underneath a process on a PV diagram is the (negative) work done on the gas through that process. What does the area under a process on an ST diagram correspond to?

(c) Draw the ST diagram for the Carnot cycle.

(d) Draw ST diagrams for the Otto and Diesel cycles.