

2.F.6. Mnemonics

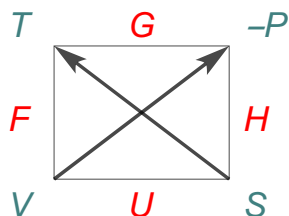
The prolific amount of relations between partial derivatives makes a mnemonic device desirable.

Consider then an PVT system with

$$U = TS - PV$$

$$dU = TdS - PdV$$

All information concerning the system, as discussed in §§2.F.1-4, can be read directly from the following diagram, often called the **thermodynamic square**.



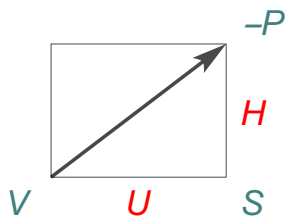
For example, the functional dependence

$$U = U(V, S) \quad H = H(P, S)$$

and the Legendre transforms

$$U - V(-P) = H \quad H - [-(-P) V] = U$$

can be read from the following sub-diagram, where travelling opposite the arrow earns an extra negative sign.



Another example is reading

$$\left(\frac{\partial U}{\partial S} \right)_V = T \quad \left(\frac{\partial U}{\partial V} \right)_S = -P$$

and the Maxwell relations

$$\left(\frac{\partial T}{\partial V} \right)_S = \left(\frac{\partial (-P)}{\partial S} \right)_V \quad \left(\frac{\partial T}{\partial (-P)} \right)_S = - \left(\frac{\partial V}{\partial S} \right)_P$$

from the diagram below.

