TABLE 8.1 Relationships involving the thermodynamic potentials.

Thermodynamic Potential	Independent Variables	Reciprocity Relations	Maxwell Relations
Internal energy	S, V	$T = \left(\frac{\partial U}{\partial S}\right)_V$	$\left(\frac{\partial T}{\partial V}\right)_S = -\left(\frac{\partial P}{\partial S}\right)_V$
U	$dU = T\,dS - P\,dV$	$-P = \left(\frac{\partial U}{\partial V}\right)_S$	$= \frac{\partial^2 U}{\partial V\,\partial S}$
Enthalpy	S, P	$T = \left(\frac{\partial H}{\partial S}\right)_P$	$\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P$
$H = U + PV$	$dH = T\,dS + V\,dP$	$V = \left(\frac{\partial H}{\partial P}\right)_S$	$= \frac{\partial^2 H}{\partial P\,\partial S}$
Helmholtz function	T, V	$S = -\left(\frac{\partial F}{\partial T}\right)_V$	$\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial P}{\partial T}\right)_V$
$F = U - TS$	$dF = -S\,dT - P\,dV$	$-P = \left(\frac{\partial F}{\partial V}\right)_T$	$= -\frac{\partial^2 F}{\partial V\,\partial T}$
Gibbs function	T, P	$S = -\left(\frac{\partial G}{\partial T}\right)_P$	$\left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_P$
$G = U - TS + PV$ $= H - TS$	$dG = -S dT + V\,dP$	$V = \left(\frac{\partial G}{\partial P}\right)_T$	$= -\frac{\partial^2 G}{\partial P\,\partial T}$