Maths Supervision Work 11

$H = U + pV$

~~$dH = \left.\frac{\partial H}{\partial V}\right|_p dU + \left.\frac{\partial H}{\partial S}\right|_p dS$~~

~~$= \frac{\partial}{\partial U}(U+pV)$~~

$dH = \frac{\partial H}{\partial U} dU + \frac{\partial H}{\partial p} dp + \frac{\partial H}{\partial V} dV$

$= \frac{\partial}{\partial U}(U+pV)dU + \frac{\partial}{\partial p}(U+pV)dp + \frac{\partial}{\partial V}(U+pV)dV$

$= dU + V dp + p dV$ you can do that straight away and apply the diffierential from H= U+pV

$= T dS - p dV + V dp + p dV$

$= T dS + V dp$

$\therefore \left.\frac{\partial T}{\partial p}\right|_S = \left.\frac{\partial V}{\partial S}\right|_p$

$U = H - pV$

$\frac{\partial U}{\partial p} = \frac{\partial H}{\partial p} - V = T\frac{\partial S}{\partial p} + V - V = T\frac{\partial S}{\partial p}$ you have to specify if it is a p, S, V const !!! starting with dU= TdS-dV

$\frac{\partial^2 U}{\partial V \partial p} = \frac{\partial T}{\partial V}\cdot\frac{\partial S}{\partial p}$ what about the d/dV of dS/dp???

$\frac{\partial^2 U}{\partial V} = \frac{\partial H}{\partial V} - p = T\frac{\partial S}{\partial V} - p$

$\frac{\partial^2 U}{\partial p \partial V} = \frac{\partial T}{\partial p}\frac{\partial S}{\partial V} - 1 = \frac{\partial T}{\partial V}\cdot\frac{\partial S}{\partial p}$

$\therefore \left.\frac{\partial S}{\partial V}\right|_p \left.\frac{\partial T}{\partial p}\right|_V - \left.\frac{\partial S}{\partial p}\right|_V \left.\frac{\partial T}{\partial V}\right|_p = 1$ ok

11. $\frac{\partial T}{\partial V} = -\frac{\partial p}{\partial S}$ $\frac{\partial V}{\partial T} = \frac{\partial S}{\partial p}$

$\frac{\partial G}{\partial p} = V$

$\therefore G = \int V\,dp$ T constant

$dU = TdS - pdV$

$\frac{\partial U}{\partial S} = T$

$\frac{\partial^2 U}{\partial T \partial S} = 1 \implies \frac{\partial U}{\partial T} = S + C(V)$

$\frac{\partial U}{\partial V} = -p$

$\frac{\partial^2 U}{\partial p \partial V} = -1 \implies \frac{\partial U}{\partial p} = -V + D(S)$

$\therefore dU = (-V + D(S))\,dp + (S + C(V))\,dT$

Let $G = -U$ with $C(V) = 0 = D(S)$ $\forall V, S$

ohhhh !!!

why G=-U???

$\therefore dG = Vdp - SdT$

$\therefore \frac{\partial V}{\partial T} = -\frac{\partial S}{\partial p}$

dG= Vdp-SdT

dU=TdS-pdV

dG-dU = d(-ST)+d (pV)

so G= U+pV-ST