10.10: J- Thermodynamic Master Equations

$E(S,V,N)$

$$dE = TdS - pdV + \mu dN$$

$F(T,V,N) = E - TS$

$$dF = -SdT - pdV + \mu dN$$

$H(S,p,N) = E + pV$

$$dH = TdS + Vdp + \mu dN$$

$G(T,p,N) = F + pV$

$$dG = -SdT + Vdp + \mu dN$$

$\Pi(T,V,\mu) = F - \mu N = -pV$

$$d\Pi = -SdT - pdV - Nd\mu$$

$p(T,\mu)$ [intensive quantities only]

$$dp = \mathcal{S}dT + \rho d\mu \quad [\mathcal{S} = S/V, \quad \rho = N/V]$$
