

10.40 Thermodynamics  
Problem Set 4

Fall 2003

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 Problem 5.2 Text
 

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**Solution:**

$$y^{(0)} = f(\underline{S}, \underline{V}, N_1, \dots, N_n)$$

(a) reorder,

$$y^{(0)} = f(\underline{S}, N_1, N_2, \dots, N_n, \underline{V})$$

then

$$y^{(n+1)} \equiv y^{(0)} - T\underline{S} - \sum \mu_j N_j$$

$$dy^{(n+1)} = -\underline{S}dT - \sum_{j=1}^n N_j d\mu_j - Pd\underline{V}$$

(b) resolve the basis function to give

$$y^{(0)} = \underline{S} = f(\underline{U}, \underline{V}, N_1, \dots, N_n)$$

$$y^{(1)} = \underline{S} - (1/T)\underline{U}$$

$$dy^{(0)} = (1/T)d\underline{U} + (P/T)d\underline{V} - \sum (\mu_j/T)dN_j$$

$$dy^{(1)} = -\underline{U}d(1/T) + (P/T)d\underline{V} - \sum (\mu_j/T)dN_j$$