$$sc(\Delta_e) = \sum_e \left(\frac{1}{\alpha_e} \Delta_e^2 - \Delta_e \beta_e \right) \qquad w/\ \Delta_e = \lambda_n - \lambda_m$$

$$\frac{d}{d\beta_k} sc(\Delta_e) = \underbrace{\sum_e \left(\frac{2}{\alpha_e} \Delta_e \Delta_e' \right)}_{A} - \underbrace{\sum_e \left(\frac{\beta_e}{\alpha_e} \Delta_e' \right)}_{B} - \underbrace{\frac{1}{\alpha_k} \Delta_k}_{C}$$

claim: $\frac{d}{d\beta_k} sc(\Delta_e) = \text{const} \Rightarrow sc(\Delta_e)$ linear in β_e

use:

- $\vec{\lambda} = -C\vec{\beta} + D\vec{p} \quad w/\ M^{-1} = \begin{vmatrix} A & B \\ C & D \end{vmatrix}$ from $\vec{x} = M\vec{y}$
- $\frac{d}{d\beta_e} \vec{\lambda} = -C$

$$\Rightarrow \lambda_n = -\sum_e C_{ne}\beta_e + \sum_j D_{nj} P_j$$

$$\frac{\partial}{\partial \beta_e} \lambda_n = -C_{ne}$$

Different C!

This is true but not proven, yet.

proof: $\frac{d}{d\beta_k} sc(\Delta_e) = A - B - C = -B + C$

- $B = \sum_e \frac{\beta_e}{\alpha_e} \left(\lambda_n' - \lambda_m' \right) = \sum_e \frac{\beta_e}{\alpha_e} \left(C_{ne} - C_{me} \right)$

Unten fehlt ein α.

- $C = \frac{1}{\alpha_k} \Delta_k = \frac{1}{\alpha_{ab}} (\lambda_a - \lambda_b) = \left(-\sum_e C_{ae}\beta_e + \sum_j D_{aj} P_j + \sum_e C_{be} \beta_e - \sum_j D_{bj} P_j \right) \frac{1}{\alpha_{ab}}$

$$= \left(\sum_e (C_{be} - C_{ae}) \beta_e + \sum_j (D_{aj} - D_{bj}) P_j \right) \frac{1}{\alpha_{ab}}$$

$$\Rightarrow \frac{d}{d\beta_k} sc(\Delta_e) = C - B = \frac{1}{\alpha_{ab}} \sum_j (D_{aj} - D_{bj}) P_j$$