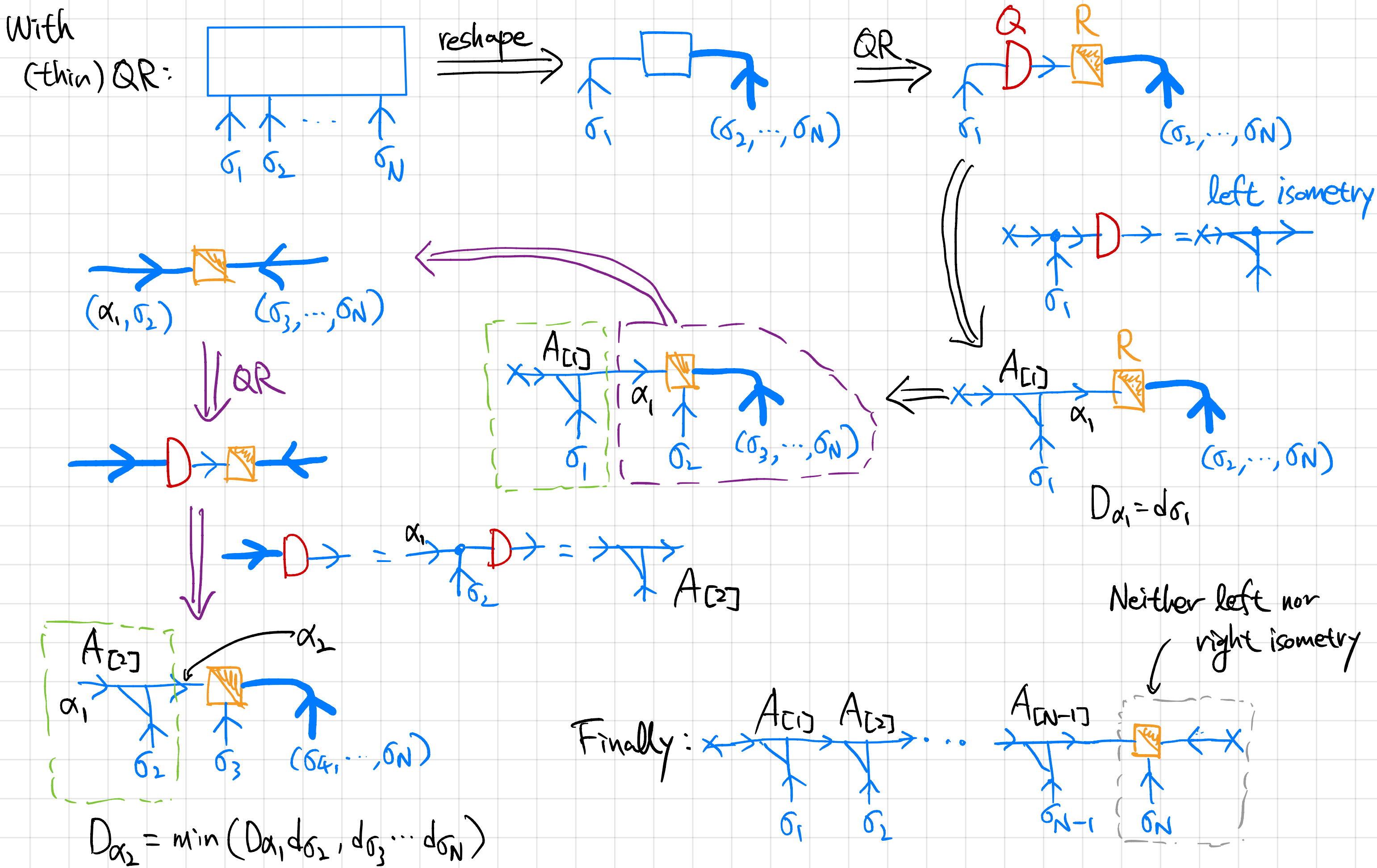
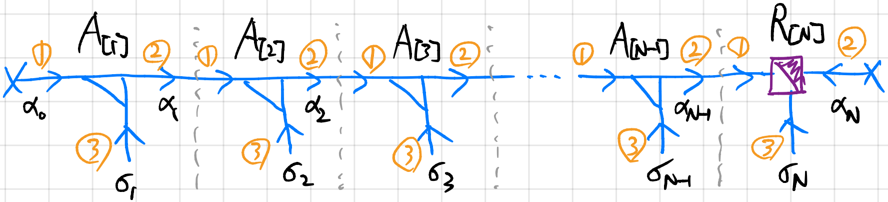
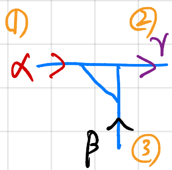
Decompose tensors into matrix product states (MPS)



Why called matrix product states?

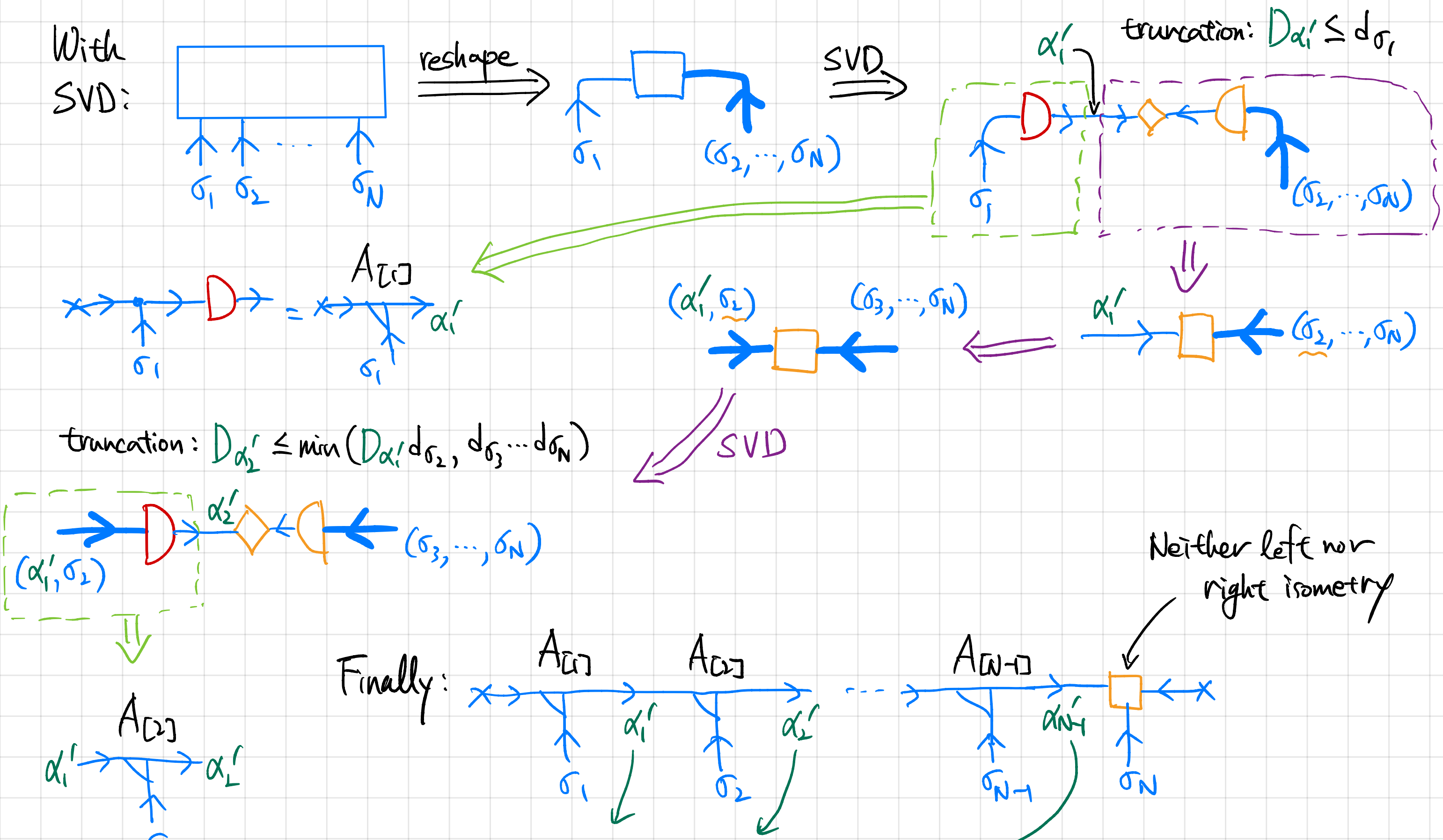




$$A_{\gamma}^{\alpha\,\beta} = U_{(\alpha,\beta),\gamma}$$

$$|\psi\rangle = |\sigma_N\rangle|\sigma_{N-1}\rangle \cdots |\sigma_2\rangle|\sigma_1\rangle \underbrace{A_{[1]\,\alpha_1}^{\alpha_0\,\sigma_1} A_{[2]\,\alpha_2}^{\alpha_1\,\sigma_2} \cdots A_{[N-1]\,\alpha_{N-1}}^{\alpha_{N-2}\,\sigma_{N-1}} R_{[N]\,\alpha_N}^{\alpha_{N-1}\,\sigma_N}}$$

Rank-3 tensors with fixed indices for their physical legs = matrices



“Bonds” can be truncated

$\Rightarrow$ More compact representation of MPS