

$$\partial_t \Gamma_k[\phi] = \frac{1}{2} \sum_{i,j=1}^N \int_{p,q} \partial_t R_{k,ij}(p,q) \circlearrowleft[p,q] \left[ \Gamma_k^{(2)}[\phi] + R_k \right]_{ji}^{-1}(q,p),$$