

Simplify@With[{ $\mathbb{E}$  = MatrixExp},

$$\mathbb{E}[\eta_i \hat{y}] \cdot \mathbb{E}[\beta_i \hat{b}] \cdot \mathbb{E}[\alpha_i \hat{a}] \cdot \mathbb{E}[\xi_i \hat{x}] \cdot \mathbb{E}[\eta_j \hat{y}] \cdot \mathbb{E}[\beta_j \hat{b}] \cdot$$

$$\mathbb{E}[\alpha_j \hat{a}] \cdot \mathbb{E}[\xi_j \hat{x}] = \mathbb{E}[\hat{y} \partial_{y_k} \Lambda] \cdot \mathbb{E}[\hat{b} \partial_{b_k} \Lambda] \cdot \mathbb{E}[\hat{a} \partial_{a_k} \Lambda] \cdot$$

$$\mathbb{E}[\hat{x} \partial_{x_k} \Lambda]$$