5. show $\underline{P} = \dfrac{\partial \psi}{\partial \underline{F}} = \underline{U} \begin{pmatrix} \dfrac{\partial \hat{\psi}}{\partial \sigma_1} & & \\ & \dfrac{\partial \hat{\psi}}{\partial \sigma_2} & \\ & & \dfrac{\partial \hat{\psi}}{\partial \sigma_3} \end{pmatrix} \underline{V}^T$

$$P_{ij} = \frac{\partial \psi}{\partial F_{ij}} = \frac{\partial \hat{\psi}}{\partial \sigma_k} \frac{\partial \sigma_k}{\partial F_{ij}} = \frac{\partial \hat{\psi}}{\partial \sigma_k} \frac{\partial \left(U^T_{km} F_{mn} V_{nk} \right)}{\partial F_{ij}}$$

$$= \frac{\partial \hat{\psi}}{\partial \sigma_k} U^T{}_{km} V_{nk} \delta_{mi} \delta_{nj}$$

$$= \frac{\partial \hat{\psi}}{\partial \sigma_k} U^T{}_{ki} V_{jk}$$

$$= \frac{\partial \hat{\psi}}{\partial \sigma_k} U_{ik} V^T{}_{kj} = U_{ik} \frac{\partial \hat{\psi}}{\partial \sigma_k} V^T_{kj} = \left[\underline{U} \begin{pmatrix} \dfrac{\partial \hat{\psi}}{\partial \sigma_1} & & \\ & \dfrac{\partial \hat{\psi}}{\partial \sigma_2} & \\ & & \dfrac{\partial \hat{\psi}}{\partial \sigma_3} \end{pmatrix} \underline{V}^T \right]_{ij}$$