

$$\overbrace{\begin{pmatrix} x \\ \sigma \mathbb{P}_\ell^i \\ \mu \sigma \mathbb{P}_\ell^i \end{pmatrix} \times \underbrace{\mathbb{C} : \mathbb{P}} \times \underbrace{\mathbb{P} : \mathbb{P}}}_{\text{LHS}} = \begin{pmatrix} x \\ \sigma \mathbb{P}_\ell^i \\ \mu \sigma \mathbb{P}_\ell^i \end{pmatrix} \times \underbrace{\mathbb{C} \mathbb{P} : \mathbb{P} \mathbb{P}}_{\text{RHS}}$$

$$\text{LHS} = \begin{pmatrix} x \mathbb{C} \\ x \mathbb{P}_\ell^i \mathbb{P} \\ x \mathbb{C}^{-1} \nu^x \left(\underbrace{\partial_{\nu \sigma \mathbb{P}_\ell^i}}_{\mathbb{P}} + \underbrace{\sigma \mathbb{P}_\ell^i m \partial_j^\tau}_{\mathbb{P}} \nu \mathbb{P}_m^j \right) \end{pmatrix} \times \underbrace{\mathbb{P} : \mathbb{P}}_{\text{RHS}}$$

$$= \begin{pmatrix} x \mathbb{C} \mathbb{P} \\ x \mathbb{C} \mathbb{P}_\ell^i x \mathbb{P} \mathbb{P} \\ x \mathbb{C}^{-1} \nu \left(\underbrace{\partial_{\nu \mathbb{P}_\ell^i}}_{x \mathbb{P} \mathbb{P}} + \underbrace{\mathbb{P}_\ell^i m \partial_j^\tau}_{\mathbb{P}} x \mathbb{C}^{-1} \lambda^x \left(\underbrace{\partial_{\lambda \tau \mathbb{P}_m^j}}_{\mathbb{P}} + \underbrace{\tau \mathbb{P}_m^j \partial_{k_e}^{gn}}_{\mathbb{P}} \lambda_e \mathbb{P}_n^k \right) \right) \end{pmatrix}$$

$$\text{RHS} = \begin{pmatrix} x \mathbb{C} \mathbb{P} \\ x \mathbb{C} \mathbb{P}_\ell^i x \mathbb{P} \mathbb{P} \\ x \mathbb{C}^{-1} \lambda^x \left(\underbrace{\partial_{\lambda \mathbb{P}_\ell^i \mathbb{P}}}_{\mathbb{P}} + \underbrace{\mathbb{P}_\ell^i m \partial_{k_e}^{gn}}_{\mathbb{P}} \lambda_e \mathbb{P}_n^k \right) \end{pmatrix}$$

$$= \begin{pmatrix} x \mathbb{C} \mathbb{P} \\ x \mathbb{C} \mathbb{P}_\ell^i x \mathbb{P} \mathbb{P} \\ x \mathbb{C}^{-1} \nu x \mathbb{C}^{-1} \lambda^x \left(x \mathbb{C}^{-1} \lambda^x \left(\underbrace{\partial_{\nu \mathbb{P}_\ell^i}}_{x \mathbb{P} \mathbb{P}} + \underbrace{\mathbb{P}_\ell^i m \partial_j^\tau}_{\mathbb{P}} \partial_{\lambda \tau \mathbb{P}_m^j} x \mathbb{P} + \underbrace{\mathbb{P}_\ell^i m \partial_j^\tau}_{\mathbb{P}} \tau \mathbb{P}_m^j \partial_{k_e}^{gn} \lambda_e \mathbb{P}_n^k \right) \right) \end{pmatrix}$$