

$$\text{Y} \in {}^{\text{h}}\Delta_{\infty}^r \mathbb{K}_r^{\text{C}}$$

$$x \times {}^{\text{h}}\Delta^r \mathbb{K}_r \xleftarrow{x:\boxed{\text{Y}}} x \times {}^{\text{h}}\Delta^r \mathbb{K}_r \xleftarrow{x:\boxed{\text{Y}:}} x \times {}^{\text{h}}\Delta^r \mathbb{K}_r$$

$\xrightarrow{x:\boxed{\text{Y}\text{Y}:}}$

$${}^x \boxed{\underset{\sigma}{\text{Y} \mid \text{Y}}}^i_m = {}^x \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}}_k {}^x \underset{m}{\text{Y}}^{-1} - \underset{\sigma}{\text{X}} \underset{k}{\text{Y}} {}^x \underset{m}{\text{Y}}^{-1} = \overbrace{{}^x \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}}_k}^i - \underset{\sigma}{\text{X}} \underset{k}{\text{Y}} {}^x \underset{m}{\text{Y}}^{-1}$$

$${}^x \boxed{\underset{\sigma}{\text{Y} \mid \text{Y}}}^{\cdot} = {}^x \underset{\cdot}{\text{Y}} \underset{\sigma}{\text{Y}} \cdot {}^x \underset{\cdot}{\text{Y}}^{-1} - \underset{\sigma}{\text{X}} \underset{\cdot}{\text{Y}} \cdot {}^x \underset{\cdot}{\text{Y}}^{-1} = \overbrace{{}^x \underset{\cdot}{\text{Y}} \underset{\sigma}{\text{Y}}}^{\cdot} - \underset{\sigma}{\text{X}} \underset{\cdot}{\text{Y}} \cdot {}^x \underset{\cdot}{\text{Y}}^{-1}$$

$${}^x \text{Y} = x = {}^x \text{I}$$

$${}^x \boxed{\underset{\mu\sigma}{\text{Y} \mid \text{Y}: \text{Y}}}^i_m = \overbrace{{}^x \underset{\mu}{\text{Y}} \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}}_n}^i - \underset{\mu\sigma}{\text{X}} \underset{n}{\text{Y}} - \underbrace{{}^x \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}}_k}^i - \underset{\sigma}{\text{X}} \underset{k}{\text{Y}} {}^x \underset{\ell}{\text{Y}}^{-1} \underset{\mu}{\text{Y}}_n + {}^x \underset{j}{\text{Y}} \underset{\mu\sigma}{\text{Y}}_n {}^x \underset{m}{\text{Y}}^{-1}$$

$$\mu\sigma \text{Y} = {}^x \text{Y}^{\nu} \overbrace{{}^x \boxed{\underset{\sigma}{\text{Y} \mid \text{Y}}}^{\cdot} + {}^n \boxed{\underset{j}{\text{Y} \mid \text{Y}}}^{\tau}}^{\nu\tau \text{Y}_n} = \overbrace{{}^x \underset{\mu}{\text{Y}} \underset{\cdot}{\text{Y}} \cdot - \underset{\mu\sigma}{\text{X}} \underset{\cdot}{\text{Y}} \cdot}^{\mu\sigma \text{Y}} - {}^x \underset{\cdot}{\text{Y}} \underset{\sigma}{\text{Y}} \cdot {}^x \underset{\cdot}{\text{Y}}^{-1} \underset{\mu}{\text{Y}} \cdot + \underset{\sigma}{\text{X}} \underset{\cdot}{\text{Y}} \cdot {}^x \underset{\cdot}{\text{Y}}^{-1} \underset{\mu}{\text{Y}} \cdot + {}^x \underset{\cdot}{\text{Y}} \cdot {}^x \underset{\mu\sigma}{\text{Y}} \cdot {}^x \underset{\cdot}{\text{Y}}^{-1}$$

$${}^x \boxed{\underset{\nu}{\text{Y} \mid \text{Y}}}^i_m = \underbrace{{}^x \underset{\nu}{\text{Y}} \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}}_k}^i - \underset{\sigma}{\text{X}} \underset{k}{\text{Y}} {}^x \underset{m}{\text{Y}}^{-1} = \overbrace{{}^x \underset{\nu}{\text{Y}} \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}}_k}^i - \underset{\sigma}{\text{X}} \underset{k}{\text{Y}} {}^x \underset{m}{\text{Y}}^{-1} + \underbrace{{}^x \underset{\nu}{\text{Y}} \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}}_k}^i - \underset{\sigma}{\text{X}} \underset{k}{\text{Y}} {}^x \underset{m}{\text{Y}}^{-1}$$

$$= \overbrace{{}^x \underset{\nu}{\text{Y}} \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}}_k}^i - \underset{\nu\sigma}{\text{X}} \underset{k}{\text{Y}} {}^x \underset{m}{\text{Y}}^{-1} - \underbrace{{}^x \underset{\nu}{\text{Y}} \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}}_k}^i - \underset{\sigma}{\text{X}} \underset{k}{\text{Y}} {}^x \underset{\ell}{\text{Y}}^{-1} \underset{\nu}{\text{Y}}_n {}^x \underset{m}{\text{Y}}^{-1} = \overbrace{{}^x \underset{\nu}{\text{Y}} \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}}_n}^i - \underset{\nu\sigma}{\text{X}} \underset{k}{\text{Y}} {}^x \underset{m}{\text{Y}}^{-1} - \underbrace{{}^x \underset{\nu}{\text{Y}} \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}}_k}^i - \underset{\sigma}{\text{X}} \underset{k}{\text{Y}} {}^x \underset{\ell}{\text{Y}}^{-1} \underset{\nu}{\text{Y}}_n {}^x \underset{m}{\text{Y}}^{-1}$$

$${}^n \boxed{\underset{j}{\text{Y} \mid \text{Y}}}^{\tau} = {}^x \underset{k}{\text{Y}} \underset{\sigma}{\text{Y}}_j \delta_j \underset{\sigma}{\text{Y}} \delta^{\tau} \underset{n}{\text{Y}} \delta_{\ell} {}^x \underset{m}{\text{Y}}^{-1} = {}^x \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}} \delta^{\tau} {}^x \underset{m}{\text{Y}}^{-1}$$

$${}^n \boxed{\underset{j}{\text{Y} \mid \text{Y}}}^{\tau} \underset{\nu\tau}{\text{Y}}_n = {}^x \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}} \delta^{\tau} {}^x \underset{m}{\text{Y}}^{-1} \underset{\nu\tau}{\text{Y}}_n = {}^x \underset{j}{\text{Y}} \underset{\nu\sigma}{\text{Y}}_n {}^x \underset{m}{\text{Y}}^{-1}$$

$$\Rightarrow \text{LHS} = {}^x \underset{\nu}{\text{Y}} \underset{\sigma}{\text{Y}}_m + {}^n \boxed{\underset{j}{\text{Y} \mid \text{Y}}}^{\tau} \underset{\nu\tau}{\text{Y}}_n$$

$$= {}_{\mu} \delta^{\nu} \overbrace{{}^x \underset{\nu}{\text{Y}} \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}}_n}^i - \underset{\nu\sigma}{\text{X}} \underset{n}{\text{Y}} - \underbrace{{}^x \underset{\nu}{\text{Y}} \underset{j}{\text{Y}} \underset{\sigma}{\text{Y}}_k}^i - \underset{\sigma}{\text{X}} \underset{k}{\text{Y}} {}^x \underset{\ell}{\text{Y}}^{-1} \underset{\nu}{\text{Y}}_n {}^x \underset{m}{\text{Y}}^{-1} = \text{RHS}$$

$$\begin{aligned}
& \frac{x}{\mu\sigma} \boxed{\text{Y|Y|Y}}_k^i - \frac{x}{\sigma\mu} \boxed{\text{Y|Y|Y}}_k^i + \underbrace{\kappa \frac{x}{\mu} \boxed{\text{Y|Y}}_{j\sigma}^i}_{\text{gauge inv}} \underbrace{\frac{x}{j\sigma} \boxed{\text{Y|Y}}_k^j}_{\text{gauge inv}} - \underbrace{\frac{x}{\sigma} \boxed{\text{Y|Y}}_{j\mu}^i}_{\text{gauge inv}} \underbrace{\frac{x}{j\mu} \boxed{\text{Y|Y}}_k^j}_{\text{gauge inv}}
\end{aligned}$$

$$\begin{aligned}
\text{LHS} &= \overbrace{\frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i - \kappa \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i - \frac{x}{\sigma\mu} \boxed{\text{Y|Y}}_{\mu\sigma}^{i-1} \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i + \kappa \frac{x}{\sigma\mu} \boxed{\text{Y|Y}}_{\mu\sigma}^{i-1} \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i + \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^{i-1}}^{\text{gauge inv}} \\
&\quad - \overbrace{\frac{x}{\sigma\mu} \boxed{\text{Y|Y}}_{\mu\sigma}^i - \kappa \frac{x}{\sigma\mu} \boxed{\text{Y|Y}}_{\mu\sigma}^i - \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^{i-1} \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i + \kappa \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^{i-1} \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i + \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^{i-1}}^{\text{gauge inv}} \\
&\quad + \underbrace{\kappa \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^i - \kappa \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i - \kappa \frac{x}{\sigma\mu} \boxed{\text{Y|Y}}_{\sigma\mu}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i - \kappa \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^i - \kappa \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i}_{\text{gauge inv}} \\
&= \overbrace{\frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i - \frac{x}{\sigma\mu} \boxed{\text{Y|Y}}_{\mu\sigma}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^{i-1} + \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^{i-1} \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i - \frac{x}{\sigma\mu} \boxed{\text{Y|Y}}_{\mu\sigma}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^{i-1} + \kappa \frac{x}{\sigma\mu} \boxed{\text{Y|Y}}_{\mu\sigma}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i - \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i}^{\text{gauge inv}} \\
&\quad + \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^{i-1} + \kappa \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^{i-1} \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^i + \kappa \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i - \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^i \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\sigma\mu}^i \\
&= \underbrace{\frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^i - \frac{x}{\sigma\mu} \boxed{\text{Y|Y}}_{\mu\sigma}^i + \kappa \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^i - \frac{x}{\sigma\mu} \boxed{\text{Y|Y}}_{\mu\sigma}^i}_{\text{gauge inv}} \frac{x}{\mu\sigma} \boxed{\text{Y|Y}}_{\mu\sigma}^{i-1} = \text{RHS}
\end{aligned}$$