

$$\text{motion } {}^A\mathbb{T}_{B\mu_-}^{\mu} x_{\mu_-}^{jB} - m x^{iA} = 0$$

$$\begin{aligned} & \int_{\mathbb{R}^d} dx \, x^{iA_*} \overbrace{\frac{iA}{-1} A \mathbb{T}_{B\mu_-}^{\mu} x_{\mu_-}^{jB} - m x^{iA}} + x^{iA_*} \overbrace{\frac{iA}{-1} A \mathbb{T}_{B\mu_-}^{\mu} x_{\mu_-}^{jB} - m x^{iA}} \\ &= \int_{\mathbb{R}^d} dx \, x^{iA_*} \overbrace{\frac{iA}{-1} A \mathbb{T}_{B\mu_-}^{\mu} x_{\mu_-}^{jB} - m x^{iA}} - x_{\mu_-}^{iA_*} \overbrace{\frac{iA}{-1} A \mathbb{T}_B^{\mu} x_{\mu_-}^{jB} - m x^{iA_*} \frac{iA}{-1} x^{iA}} \\ &= \int_{\mathbb{R}^d} dx \, x^{iA_*} \overbrace{\frac{iA}{-1} A \mathbb{T}_{B\mu_-}^{\mu} x_{\mu_-}^{jB} - m x^{iA}} + x_{\mu_-}^{iA_*} \overbrace{B \mathbb{T}_A^{\mu} \frac{jB}{-1} x_{\mu_-}^{jB} - m x_{\mu_-}^{jB} \frac{jB}{-1} x^{jB}} \\ &= \int_{\mathbb{R}^d} dx \, x^{iA_*} \overbrace{\frac{iA}{-1} A \mathbb{T}_{B\mu_-}^{\mu} x_{\mu_-}^{jB} - m x^{iA}} + \overbrace{B \mathbb{T}_A^{\mu} x_{\mu_-}^{iA} - m x_{\mu_-}^{jB}}^* \overbrace{\frac{jB}{-1} x_{\mu_-}^{jB}} = 2\Re \int_{\mathbb{R}^d} dx \, x^{iA_*} \overbrace{\frac{iA}{-1} A \mathbb{T}_{B\mu_-}^{\mu} x_{\mu_-}^{jB} - m x^{iA}}_{=0} \end{aligned}$$