$$\underbrace{\imath - \partial}\,\overset{t}{\alpha}\,\beta\,\overbrace{\imath - \partial}^{t} \;=\; \underbrace{\imath_\alpha - \partial_\alpha}\,\underbrace{\imath_\beta - \partial_\beta}$$

$$\exp\left(\underbrace{\overset{t}{\zeta}\zeta}\,\bowtie\,\underbrace{\overset{t}{\omega}\omega}\right) = \exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right)$$

$$\partial_\beta \exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right) = \exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right)\partial_\beta\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2} = \exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right)\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}}$$

$$\left(\partial_\beta - \imath_\beta\right)\exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right) = \exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right)\overbrace{\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} - \beta\overset{*}{\zeta}}$$

$$\partial_\alpha\left(\partial_\beta - \imath_\beta\right)\exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right) = \partial_\alpha\underbrace{\exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right)\left(\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} - \beta\overset{*}{\zeta}\right)}$$

$$= \underbrace{\partial_\alpha\exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right)}\overbrace{\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} - \beta\overset{*}{\zeta}} + \exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right)\underbrace{\partial_\alpha\overbrace{\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} - \beta\overset{*}{\zeta}}}$$

$$= \exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right)\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\alpha\overset{*}{\omega}}\,\overbrace{\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} - \beta\overset{*}{\zeta}} + \exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right)\underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}}$$

$$= \exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right)\overbrace{\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} - \underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\zeta}} + \underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}}}$$

$$\underbrace{\partial_\alpha - \imath_\alpha}\,\underbrace{\partial_\beta - \imath_\beta}\exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right) = \exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right)\left(\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} - \underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\zeta}} + \underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} - \underbrace{\alpha\overset{*}{\zeta}}\,\overbrace{\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} - \beta\overset{*}{\zeta}}\right)$$

$$= \exp\left(\frac{1}{2}\underbrace{\zeta\overset{*}{\omega}}^{\,2}\right)\left(\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} - \underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\zeta}} + \underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} - \underbrace{\alpha\overset{*}{\zeta}}\,\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} + \underbrace{\alpha\overset{*}{\zeta}}\,\underbrace{\beta\overset{*}{\zeta}}\right)$$

$$= \exp\left(\frac{1}{2}x\bowtie y\right)\overbrace{\underbrace{x\bowtie x}\,\underbrace{w\bowtie y} - \underbrace{\alpha\overset{*}{\zeta}}\,\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} - \underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\zeta}} + w\bowtie x + w\bowtie y}$$

$$\dot{w} \;=\; \overset{t}{\alpha}\,\beta\colon\quad x = \overset{t}{\zeta}\,\zeta\colon\quad y = \overset{t}{\omega}\,\omega$$

$$w\bowtie x = \underbrace{\beta\overset{*}{\zeta}}\,\underbrace{\alpha\overset{*}{\zeta}}\colon\quad w\bowtie y = \underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}}$$

$$\underbrace{x\bowtie x}\,\underbrace{w\bowtie y} = \underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}}$$

$$\underbrace{\alpha\overset{*}{\zeta}}\,\underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\omega}} + \underbrace{\zeta\overset{*}{\omega}}\,\underbrace{\alpha\overset{*}{\omega}}\,\underbrace{\beta\overset{*}{\zeta}} = \frac{\underbrace{x\overset{*}{x}w}\,\bowtie y}{\sqrt{x\bowtie x}}$$