$$\begin{array}{ccc} \mho|\gimel\,\nabla_0\,\mathbb{R} & \ni & \lightning_t = e^{t\underline{\lightning}} \\ \downarrow & & \\ \Theta|\gimel & \ni & \underline{\lightning} = \partial_t^0 \lightning_t \end{array}$$

$$\mathbb{R} \xrightarrow[\text{stet hom}]{\lightning_\cdot} \mho|\gimel$$

$$t \mapsto \lightning_t$$

$$\lightning_t \overset{*}{\lightning}_t = I = \overset{*}{\lightning}_t \lightning_t$$

$$\text{hom} \quad \lightning_s \lightning_t = \lightning_{s+t} \Rightarrow \lightning_s \lightning_t = \lightning_t \lightning_s$$

$$\text{stet} \quad s\lim_{s \rightsquigarrow t} \lightning_s = \lightning_t$$

$$\mathcal{D}_{\underline{\lightning}} = \frac{\psi \in \gimel}{\gimel \ni \dfrac{\lightning_\varepsilon \psi - \psi}{\varepsilon} \underset{\|}{\rightsquigarrow} \underline{\lightning}\psi \text{ norm-Cau}} \sqsubset \gimel$$

$$\dot{\psi} \in \mathcal{D}_{\underline{\lightning}} \Rightarrow \frac{\lightning_\varepsilon \dot{\psi} - \dot{\psi}}{\varepsilon} \rightsquigarrow \underline{\lightning}\ \dot{\psi} \Rightarrow \begin{cases} \lightning_t \mathcal{D}_{\underline{\lightning}} \subset \mathcal{D}_{\underline{\lightning}} \\ \lightning_t \underline{\lightning} \underset{\mathcal{D}_{\underline{\lightning}}}{=} \underline{\lightning} \lightning_t \end{cases}$$

$$\frac{\lightning_\varepsilon \underbrace{\psi + \acute{\psi}} - \underbrace{\psi + \dot{\psi}}}{\varepsilon} = \frac{\lightning_\varepsilon \psi - \psi}{\varepsilon} + \frac{\lightning_\varepsilon \acute{\psi} - \acute{\psi}}{\varepsilon} \rightsquigarrow \underline{\lightning}\ \psi + \underline{\lightning}\ \acute{\psi} \Rightarrow \begin{cases} \psi + \acute{\psi} \in \mathcal{D}_{\underline{\lightning}} \\ \underline{\lightning} \underbrace{\psi + \acute{\psi}} = \underline{\lightning}\psi + \underline{\lightning}\acute{\psi} \end{cases}$$

$$\psi \in \mathcal{D}_{\underline{\lightning}} \Rightarrow \frac{\lightning_\varepsilon \psi - \psi}{\varepsilon} \rightsquigarrow \underline{\lightning}\ \psi \Rightarrow \frac{\lightning_\varepsilon \underbrace{\lightning_t \psi} - \lightning_t \psi}{\varepsilon} \underset{\text{comm}}{=} \lightning_t \frac{\lightning_\varepsilon \psi - \psi}{\varepsilon} \underset{\lightning_t \text{ stet}}{\rightsquigarrow} \lightning_t \underline{\lightning}\ \psi \Rightarrow \begin{cases} \lightning_t \psi \in \mathcal{D}_{\underline{\lightning}} \\ \underline{\lightning} \underbrace{\lightning_t \psi} = \lightning_t \overbrace{\underline{\lightning}\psi} \end{cases}$$

$$\mathcal{D}_{\underline{ϟ}} = \frac{\upharpoonleft \in \rceil}{\mathbb{R} \ni t \underset{\text{diff}}{\mapsto} ϟ_t \upharpoonleft \in \rceil}$$

$$\bigwedge_{\upharpoonleft \in \mathcal{D}_{\underline{ϟ}}} \partial_t \; ϟ_t \; \upharpoonleft = ϟ_t \; \underline{ϟ} \; \upharpoonleft$$

$$\supset : \quad \mathbb{R} \ni t \underset{\text{diff}}{\mapsto} ϟ_t \; \upharpoonleft \in \rceil \Rightarrow \mathbb{R} \ni t \underset{\text{diff in } 0}{\mapsto} ϟ_t \; \upharpoonleft \in \rceil \Rightarrow \begin{cases} \upharpoonleft \in \mathcal{D}_{\underline{ϟ}} \\ \partial_t^0 ϟ_t \upharpoonleft = \underline{ϟ} \upharpoonleft \end{cases}$$

$$\subset : \quad \upharpoonleft \in \mathcal{D}_{\underline{ϟ}} \Rightarrow ϟ_t \; \overbrace{\underline{ϟ} \upharpoonleft} \backsim ϟ_t \; \frac{ϟ_\varepsilon \upharpoonleft - \upharpoonleft}{\varepsilon} = \frac{ϟ_{t+\varepsilon} \upharpoonleft - ϟ_t \upharpoonleft}{\varepsilon} \rightsquigarrow \partial_t \; ϟ_t \; \upharpoonleft \Rightarrow ϟ_t \; \upharpoonleft \text{ diff}$$

$$ϟ_t \; \upharpoonleft \underset{\mathcal{D}_{\underline{ϟ}}}{=} \upharpoonleft + \int_{ds}^{0|t} \underbrace{ϟ_s \overbrace{\underline{ϟ} \upharpoonleft}}_{\text{stet}}$$

$$\partial_t \text{ RHS } = ϟ_t \; \overbrace{\underline{ϟ} \upharpoonleft} = \partial_t \text{ LHS}$$

$$ϟ_0 \; \upharpoonleft = \upharpoonleft$$

$$\mathcal{G}_{\underline{ᛋ}} \sqsubset \underline{⅂}\times\underline{⅂}$$

$$\mathcal{G}_{\underline{ᛋ}} \ni ↿_n : \underline{ᛋ}\ ↿_n \rightsquigarrow ℸ : \acute{ℸ} \in \underline{⅂}\times\underline{⅂} \Longrightarrow \begin{cases} \mathcal{D}_{\underline{ᛋ}} \ni ↿_n \underset{||}{\rightsquigarrow} ℸ y \\ \underline{y} ↿_n \underset{||}{\rightsquigarrow} \acute{ℸ} \end{cases}$$

$$\Longrightarrow \overline{\int_{ds}^{0|t} ᛋ_s \overbrace{\underline{ᛋ}↿_n} - \int_{ds}^{0|t} ᛋ_s \acute{ℸ}} \leqslant \int_{ds}^{0|t} \overline{ᛋ_s \overbrace{\underline{ᛋ}↿_n} - ᛋ_s \acute{ℸ}}\ \underset{ᛋ_s\ \text{unit}}{=} \int_{ds}^{0|t} \overline{\underline{ᛋ}↿_n - \acute{ℸ}} \rightsquigarrow 0$$

$$\Longrightarrow ᛋ_t\ ⅃ \underset{||}{\Leftarrow} ᛋ_t\ ↿_n = ↿_n + \int_{ds}^{0|t} ᛋ_s\ \overbrace{\underline{ᛋ}↿_n} \rightsquigarrow ℸ + \int_{ds}^{0|t} ᛋ_s\ \acute{ℸ}$$

$$\Longrightarrow ᛋ_t\ ℸ = ℸ + \int_{ds}^{0|t} ᛋ_s\ \acute{ℸ}\ \text{diff in } t \Longrightarrow \begin{cases} ℸ \in \mathcal{D}_{\underline{ᛋ}} \\ \underline{ᛋ}ℸ = \partial_t^0 ᛋ_t ℸ = ᛋ_0 \acute{ℸ} = \acute{ℸ} \end{cases} \Longrightarrow ℸ : \acute{ℸ} \in \mathcal{G}_{\underline{ᛋ}}$$

$$- \underline{\lightning} \sqsubset \overset{*}{\underline{\lightning}} \quad \text{skew-symm}$$

$$\xi \in \mathcal{D}_{\underline{\lightning}} \Rightarrow \bigwedge_{\xi' \in \mathcal{D}_{\underline{\lightning}}} \xi \bowtie \overbrace{\underline{\lightning}\,\xi'} = \xi \bowtie \overbrace{\partial_t^0 \lightning_t \xi'} = \partial_t^0 \overbrace{\lightning_{-t} \xi} \bowtie \xi' = -\partial_t^0 \overbrace{\lightning_t \xi} \bowtie \xi'$$

$$= -\overbrace{\partial_t^0 \lightning_t \xi} \bowtie \xi' = -\overbrace{\underline{\lightning}\,\xi} \bowtie \xi' \text{ stet in } \xi' \Rightarrow \begin{cases} \xi \in \mathcal{D}_{\overset{*}{\underline{\lightning}}} \\ \overset{*}{\underline{\lightning}}\,\xi = -\underline{\lightning}\,\xi \end{cases}$$

$$\varphi \in \mathbb{R} \overset{0}{\underset{\infty}{\triangleright}} \mathbb{R}$$

$$\eta \in \mathfrak{H} \Rightarrow \eta_\varphi := \int_{ds}^{\mathbb{R}} {}^s\varphi \;\; \lightning_s \;\eta \in \mathfrak{H} \text{ stet in } s$$

$$\eta_\varphi \in \mathcal{D}_{\underline{\lightning}}$$

$$\underline{\lightning} \;\; \eta_\varphi = -\eta_{\underline{\varphi}}$$

$$\underline{\varphi} \in \mathbb{R} \overset{0}{\underset{\infty}{\triangleright}} \mathbb{R}$$

$$\int_{dt}^{0|\varepsilon} \lightning_t \;\; \eta_{\underline{\varphi}} = \int_{dt}^{0|\varepsilon} \lightning_t \int_{ds}^{\mathbb{R}} {}^s\underline{\varphi} \underbrace{\lightning_s \eta} = \int_{ds}^{\mathbb{R}} {}^s\underline{\varphi} \int_{dt}^{0|\varepsilon} \lightning_t \;\; \underbrace{\lightning_s \eta} = \int_{ds}^{\mathbb{R}} {}^s\underline{\varphi} \int_{dt}^{0|\varepsilon} \lightning_{t+s} \;\; \eta = \int_{ds}^{\mathbb{R}} {}^s\underline{\varphi} \int_{dr}^{s|s+\varepsilon} \lightning_r \;\; \eta$$

$$= -\int_{ds}^{\mathbb{R}} {}^s\varphi \frac{d}{ds} \underbrace{\int_{dr}^{s|s+\varepsilon} \lightning_r \eta} = \int_{ds}^{\mathbb{R}} {}^s\varphi \; \underbrace{\lightning_s \eta - \lightning_{s+\varepsilon} \eta} = \int_{ds}^{\mathbb{R}} {}^{\flat}\varphi \; y_s \, \eta - \int_{ds}^{\mathbb{R}} {}^s\varphi \;\; \lightning_\varepsilon \;\; \underbrace{\lightning_s \eta} = \eta_\varphi - \lightning_\varepsilon \;\; \eta_\varphi$$

$$\Rightarrow \frac{\lightning_\varepsilon \eta_\varphi - \eta_\varphi}{\varepsilon} = -\frac{1}{\varepsilon} \int_{dt}^{0|\varepsilon} \lightning_{\llcorner} \;\; s_{\underline{\varphi}} \rightsquigarrow - \lightning_0 \;\; \eta_{\underline{\varphi}} = -\eta_{\underline{\varphi}}$$

$$\mathcal{D}_{\underline{\text{↯}}} \underset{\text{hull}}{\sqsubset} \text{⅂}$$

$$\bigwedge_{\text{⅂} \in \text{⅂}} \bigwedge_{\varepsilon > 0} \bigvee_{\delta > 0} \bigwedge_{\underline{t} \leqslant \varepsilon} \overline{\text{↯}_t \text{⅂} - \text{⅂}} \leqslant \varepsilon \Rightarrow \begin{cases} \bigvee \varphi \in \mathbb{R}_{-\delta|\delta} \underset{\infty}{\triangleright} \mathbb{R}_+ \\ \int^{\mathbb{R}} \varphi = 1 \,(*) \end{cases}$$

$$\Rightarrow \begin{cases} \text{⅂}_\varphi \in \mathcal{D}_{\underline{\text{↯}}} \\ \overline{\text{⅂}_\varphi - \text{⅂}} = \overline{\int_{dt}^{\mathbb{R}} {}^t\varphi \underbrace{\text{↯}_t \text{⅂}} - \text{⅂}} \underset{*}{=} \overline{\int_{dt}^{\mathbb{R}} {}^t\varphi \underbrace{\text{↯}_t \text{⅂} - \text{⅂}}} \leqslant \int_{dt}^{\mathbb{R}} {}^t\varphi \overline{\text{↯}_t \text{⅂} - \text{⅂}} = \int_{dt}^{-\delta|\delta} {}^t\varphi \overbrace{\overline{\text{↯}_t \text{⅂} - \text{⅂}}}^{\leqslant \varepsilon} \leqslant \varepsilon \int_{dt}^{-\delta|\delta} {}^t\varphi = \varepsilon \int_{dt}^{\mathbb{R}} {}^t\varphi = \varepsilon \end{cases}$$

$$- \underline{\text{↯}} \sqsupset \underline{\overset{*}{\text{↯}}} \Rightarrow \underline{\text{↯}} = - \underline{\overset{*}{\text{↯}}} \in \mho|\text{⅂} \text{ skew-adj}$$

$$\text{⅂} \in \mathcal{D}_{\underline{\overset{*}{\text{↯}}}} \Rightarrow \bigwedge_{\text{↿} \in \mathcal{D}_{\underline{\text{↯}}}} \text{↿} \barwedge \overbrace{\text{↯}_{-t} \text{⅂}} = \overbrace{\text{↯}_t \text{↿}} \barwedge \text{⅂} = \overbrace{\text{↿} + \int_{ds}^{0|t} \text{↯}_s \overbrace{\underline{\text{↯}} \text{↿}}} \barwedge \text{⅂}$$

$$= \text{↿} \barwedge \text{⅂} + \int_{ds}^{0|t} \overbrace{\text{↯}_s \overbrace{\underline{\text{↯}} \text{↿}} \barwedge \text{⅂}} = \text{↿} \barwedge \text{⅂} + \int_{ds}^{0|t} \text{↿} \barwedge \underbrace{\text{↯}_{-s} \underline{\overset{*}{\text{↯}}} \text{⅂}} = \text{↿} \barwedge \underbrace{\text{⅂} + \int_{ds}^{0|t} \text{↯}_{-s} \underline{\overset{*}{\text{↯}}} \text{⅂}}$$

$$\underset{\mathcal{D}_{\underline{\text{↯}}} \text{ hull}}{\Longrightarrow} \text{↯}_{-t} \text{⅂} = \text{⅂} + \int_{ds}^{0|t} \text{↯}_{-s} \underline{\overset{*}{\text{↯}}} \text{⅂} \text{ diff in } t \Rightarrow \text{⅂} \in \mathcal{D}_{\underline{\text{↯}}} \underset{\text{skew-symm}}{\Longrightarrow} \underline{\overset{*}{\text{↯}}} = - \underline{\text{↯}}$$