

$$\mathbb{I} \bigtriangleup_{\infty} \mathfrak{h} = \left\{ \mathbb{I} \frac{\mathfrak{l}}{\text{diff}} \rightarrow \mathfrak{h} \right\}$$

$$\mathfrak{h} \!:\! \mathfrak{k} \in \mathfrak{h} \! \times \! \mathfrak{h} \xrightarrow[\text{Lagr-Dichte}]{\mathcal{L}} \mathbb{R} \ni \mathfrak{h} \!:\! \mathfrak{l} \, \mathcal{L}$$

$$\boxed{t\!:\!\mathfrak{h}^{\mu}\!:\!\mathfrak{k}^{\mu}}=\overline{\mathfrak{k}\,\mathfrak{X}\,\mathfrak{k}^{\mathfrak{h}}\mathcal{A}}^{1/2}=\overline{\mathfrak{k}^{\mu}\mathfrak{k}^{\nu\mathfrak{h}}\mathcal{A}_{\mu\nu}}^{1/2}$$

$$\mathfrak{l} \mathcal{L} = \int \limits_{dt}^{\mathbb{I}} \mathfrak{l} \mathfrak{t} \mathfrak{t} \mathfrak{l} \mathcal{L} = \int \limits_{dt}^{\mathbb{I}} \overline{t \mathfrak{l} \mathfrak{X} t \mathfrak{l} \mathcal{A}}^{1/2} = \int \limits_{dt}^{\mathbb{I}} \overline{t \mathfrak{l}^{\mu} \mathfrak{X} t \mathfrak{l}^{\nu} \mathcal{A}_{\mu\nu}}^{1/2}$$

$$\mathfrak{v} \mathfrak{l} \mathcal{L} = \int \limits_{dt}^{\mathbb{I}} t \mathfrak{v} \mathfrak{l} \mathcal{L} = \int \limits_{dt}^{\mathbb{I}} t \mathfrak{v}^{\lambda} \mathfrak{l} \mathcal{L}$$

$$\boxed{t\!:\!\mathfrak{l}\!:\!t\mathfrak{l}}_{\lambda}=\frac{1}{2}\overline{t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}}^{-1/2}t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}_{\lambda}$$

$$\boxed{t\!:\!\mathfrak{l}\!:\!t\mathfrak{l}}_{\lambda}^0=\overline{t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}}^{-1/2}t\mathfrak{l}^{\varkappa}t\mathfrak{l}_{\lambda\varkappa}\mathcal{A}$$

$$\frac{1}{2}\overline{t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}}^{-1} \underbrace{t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}+t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}+t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}^{\alpha\mathfrak{l}}}_{\alpha\mathfrak{l}}t\mathfrak{l}_{\varkappa}\mathcal{A}=t\mathfrak{l}_{\varkappa}\mathcal{A}+t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}_{\varkappa}$$

$$\overline{t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}}^{-1/2} \text{ LHS } t\mathfrak{l}_{\varkappa\lambda}\mathcal{A}=\frac{d}{dt}\boxed{t\!:\!\mathfrak{l}\!:\!t\mathfrak{l}}_{\lambda}^0+\frac{1}{2}\overline{t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}}^{-3/2}\overline{t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}+t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}+t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}^{\alpha\mathfrak{l}}}_{\alpha\mathfrak{l}}t\mathfrak{l}_{\varkappa}\mathcal{A}_{\varkappa\lambda}-\boxed{t\!:\!\mathfrak{l}\!:\!t\mathfrak{l}}_{\lambda}$$

$$=\frac{d}{dt}\boxed{t\!:\!\mathfrak{l}\!:\!t\mathfrak{l}}_{\lambda}^0-\frac{d}{dt}\overline{t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}}^{-1/2}t\mathfrak{l}_{\varkappa}\mathcal{A}_{\varkappa\lambda}-\boxed{t\!:\!\mathfrak{l}\!:\!t\mathfrak{l}}_{\lambda}=\overline{t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}}^{-1/2}\frac{d}{dt}t\mathfrak{l}_{\varkappa}\mathcal{A}_{\varkappa\lambda}-\boxed{t\!:\!\mathfrak{l}\!:\!t\mathfrak{l}}_{\lambda}$$

$$\Rightarrow \underbrace{\text{LHS}}_{-t\mathfrak{l}_{\varkappa}\mathcal{A}_{\varkappa\lambda}}-t\mathfrak{l}_{\varkappa}\mathcal{A}_{\varkappa\lambda}=\frac{d}{dt}t\mathfrak{l}_{\varkappa}\mathcal{A}_{\varkappa\lambda}-t\mathfrak{l}_{\varkappa}\mathcal{A}_{\varkappa\lambda}-\overline{t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}}^{1/2}\boxed{t\!:\!\mathfrak{l}\!:\!t\mathfrak{l}}_{\lambda}=t\mathfrak{l}_{\varkappa}\mathcal{A}_{\varkappa\lambda}-\frac{1}{2}\overline{t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}}_{\varkappa\lambda}$$

$$=t\mathfrak{l}_{\varkappa}\mathcal{A}_{\alpha\mathfrak{l}\varkappa\lambda}^{\alpha\mathfrak{l}}-\frac{1}{2}\overline{t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}}_{\lambda}^{\mu\nu}=\frac{1}{2}\overline{t\mathfrak{l}^{\varkappa}t\mathfrak{l}^{\alpha\mathfrak{l}}\mathcal{A}_{\alpha\mathfrak{l}\varkappa\lambda}+t\mathfrak{l}^{\varkappa}t\mathfrak{l}^{\alpha\mathfrak{l}}\mathcal{A}_{\alpha\mathfrak{l}\varkappa\lambda}-t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}}_{\lambda}^{\mu\nu}=t\mathfrak{l}^{\mu}t\mathfrak{l}^{\nu}t\mathfrak{l}_{\mu\nu}\mathcal{A}_{\varkappa\lambda}^{\varkappa}\mathfrak{l}_{\varkappa\lambda}^{\mathfrak{l}}$$

$$\mathbb{H} \begin{array}{c} \blacktriangle \\ \infty \end{array} \mathfrak{h} = \frac{\mathbb{H} \xrightarrow{\mathfrak{l}} \mathfrak{h}}{\text{diff}} \\ \ddot{\mathfrak{l}}^\ell + \dot{\mathfrak{l}}^i \Gamma_j^\ell \dot{\mathfrak{l}}^j = 0$$

$$s=\int\limits_{dt}^{0|t}{}^t\mathcal{L}_{\mathfrak{l}}\Rightarrow\frac{ds}{dt}={}^t\mathcal{L}_{\mathfrak{l}}={}^t\mathcal{L}$$

$$\dot{\mathfrak{l}}=\frac{d\mathfrak{L}}{ds}\colon\quad \ddot{\mathfrak{l}}=\frac{d^2\mathfrak{L}}{ds^2}$$

$${}^t\mathfrak{l}_{\underline{}}=\frac{d\mathfrak{L}}{dt}=\frac{d\mathfrak{L}}{ds}\frac{ds}{dt}=\dot{\mathfrak{l}}\,{}^t\mathcal{L}$$

$$\begin{aligned} {}^t\mathfrak{l}_{\underline{}} &= \frac{d}{dt}\underbrace{\frac{d\mathfrak{L}}{ds}}_{{}^t\mathcal{L}} = \frac{d}{dt}\frac{d\mathfrak{L}}{ds}\,{}^t\mathcal{L} + \frac{d\mathfrak{L}}{ds}\frac{d}{dt}{}^t\mathcal{L} = \ddot{\mathfrak{l}}\,{}^t\mathcal{L}^2 + \dot{\mathfrak{l}}\,{}^t\mathcal{L}_{\underline{}} \\ &= \frac{d^2\mathfrak{L}}{ds^2}\frac{ds}{dt} = \ddot{\mathfrak{l}}\,{}^t\mathcal{L} \end{aligned}$$

$$0 = {}^t\mathfrak{l}_g\,{}^t\mathfrak{l}_{\underline{}}^* + \overbrace{{}^t\mathfrak{l}_{\underline{}}\,{}^t\mathfrak{l}_g}^{{}^t\mathcal{L}}\,{}^t\mathfrak{l}_{\underline{}}^* - \frac{{}^t\mathcal{L}}{{}^t\mathcal{L}}\,{}^t\mathfrak{l}_g\,{}^t\mathfrak{l}_{\underline{}}^* - \frac{1}{2}\,{}^t\mathfrak{l}_{\underline{}}\,\overbrace{\sim\,{}^t\mathfrak{l}_g}^{{}^t\mathcal{L}}\,{}^t\mathfrak{l}_{\underline{}}^*$$

$$= {}^t\mathfrak{l}_g\,{}^t\mathcal{L}^2\,\dot{\mathfrak{l}}^* + {}^t\mathfrak{l}_g\,{}^t\mathcal{L}_{\underline{}}\,\dot{\mathfrak{l}}^* + {}^t\mathcal{L}^2\,\overbrace{\dot{\mathfrak{l}}\,{}^t\mathfrak{l}_g}^{{}^t\mathcal{L}}\,\dot{\mathfrak{l}}^* - {}^t\mathcal{L}_{\underline{}}\,{}^t\mathfrak{l}_g\,\dot{\mathfrak{l}}^* - \frac{1}{2}\,{}^t\mathcal{L}^2\,\dot{\mathfrak{l}}\,\overbrace{\sim\,{}^t\mathfrak{l}_g}^{{}^t\mathcal{L}}\,\dot{\mathfrak{l}}^* = {}^t\mathcal{L}^2\,\underbrace{{}^t\mathfrak{l}_g\,\dot{\mathfrak{l}}^* + \overbrace{\dot{\mathfrak{l}}\,{}^t\mathfrak{l}_g}^{{}^t\mathcal{L}}\,\dot{\mathfrak{l}}^* - \frac{1}{2}\,\dot{\mathfrak{l}}\,\overbrace{\sim\,{}^t\mathfrak{l}_g}^{{}^t\mathcal{L}}\,\dot{\mathfrak{l}}^*}_{}$$

$$\Rightarrow 0 = {}^t\mathfrak{l}_g\,\ddot{\mathfrak{l}}^* + \overbrace{\dot{\mathfrak{l}}\,{}^t\mathfrak{l}_g}^{{}^t\mathcal{L}}\,\dot{\mathfrak{l}}^* - \frac{1}{2}\,\dot{\mathfrak{l}}\,\overbrace{\sim\,{}^t\mathfrak{l}_g}^{{}^t\mathcal{L}}\,\dot{\mathfrak{l}}^* \Leftrightarrow 0 = \mathfrak{l}^k\,{}^t\mathfrak{l}_g\,\ddot{\mathfrak{l}}^* + \mathfrak{l}^k\,\overbrace{\dot{\mathfrak{l}}\,{}^t\mathfrak{l}_g}^{{}^t\mathcal{L}}\,\dot{\mathfrak{l}}^* - \frac{1}{2}\,\dot{\mathfrak{l}}\,\mathfrak{l}^k\,\overbrace{\sim\,{}^t\mathfrak{l}_g}^{{}^t\mathcal{L}}\,\dot{\mathfrak{l}}^*$$

$$0 = \dot{\mathfrak{l}}^\ell + \dot{\mathfrak{l}}^i\,\Gamma_j^\ell\,\dot{\mathfrak{l}}^j \Leftrightarrow 0 = \mathfrak{l}^k\,\mathfrak{l}_{k\,\ell}\,g_\ell\,\ddot{\mathfrak{l}}^\ell + \frac{1}{2}\,\mathfrak{l}^k\,\underbrace{{}_i\partial_k g_j + {}_j\partial_k g_i - {}_k\partial_i g_j}_{{}^t\mathcal{L}}\,\dot{\mathfrak{l}}^i\,\dot{\mathfrak{l}}^j$$

$$= \mathfrak{l}^k\,g_\ell\,\ddot{\mathfrak{l}}^* + \frac{1}{2}\,\mathfrak{l}^k\,\overbrace{\mathfrak{l}^i\,g_{\underline{}}\,\dot{\mathfrak{l}}^*\,\mathfrak{l}^j\,g_{\underline{}}\,\dot{\mathfrak{l}}^*}^{{}^t\mathcal{L}} = \mathfrak{l}^k\,g_\ell\,\ddot{\mathfrak{l}}^* + \mathfrak{l}^k\,\overbrace{\dot{\mathfrak{l}}\,g_{\underline{}}}^{{}^t\mathcal{L}}\,\dot{\mathfrak{l}}^* - \frac{1}{2}\,\dot{\mathfrak{l}}\,\mathfrak{l}^k\,\overbrace{\sim\,g_{\underline{}}}^{{}^t\mathcal{L}}\,\dot{\mathfrak{l}}^*$$