$$\mathbb{1} \overset{\sharp}{\times} \overset{\sharp}{\mathbb{1}} \overset{\sharp}{\times} \mathbb{1} \xleftarrow[\text{bimod}]{} \overset{\sharp}{\mathbb{1}}$$

$$\underset{m}{\overset{\sharp}{\mathbb{1}}} \triangledown_{\mathbb{1}} = \left\{ \overset{\sharp}{\mathbb{1}} \xleftarrow{\mathbb{L}} \overset{m}{\boxtimes} \mathbb{1} \text{ m-lin} \right\}$$

$$\underset{m}{\overset{\sharp}{\mathbb{1}}} \triangledown_{\mathbb{1}} \ \underset{283}{\underline{\text{McL}}} \ \frac{\overset{\sharp}{\mathbb{1}} \xleftarrow{\mathbb{L}} \mathbb{1}^{m} \text{ m-lin}}{\mathbb{L} \underbrace{\mathbb{1}^{1} \cdot\cdot e \cdot\cdot \mathbb{1}^{m}} = 0}$$

$$\underset{\mathbb{N}}{\overset{\sharp}{\mathbb{1}}} \triangledown_{\mathbb{1}} = \sum_{m} \underset{m}{\overset{\sharp}{\mathbb{1}}} \triangledown_{\mathbb{1}}$$

$$\underset{m}{\overset{\sharp}{\mathbb{1}}} \triangledown_{\mathbb{1}} \xleftarrow{d} \underset{m+1}{\overset{\sharp}{\mathbb{1}}} \triangledown_{\mathbb{1}}$$

$$\underbrace{\mathbb{L} d} \underbrace{\mathbb{1}^{0} \overset{\cdots}{\boxtimes} \mathbb{1}^{m}} = \mathbb{1}^{0} \overset{\sharp}{\times} \overbrace{\mathbb{L} \underbrace{\mathbb{1}^{1} \overset{\cdots}{\boxtimes} \mathbb{1}^{m}}} - \overset{m}{(-1)} \overbrace{\mathbb{L} \underbrace{\mathbb{1}^{0} \overset{\cdots}{\boxtimes} \mathbb{1}^{m-1}}} \overset{\sharp}{\times} \mathbb{1}^{m} - \sum_{j}^{m} \overset{j}{(-1)} \mathbb{L} \overbrace{\underbrace{\mathbb{1}^{0} \overset{\cdots}{\boxtimes} \mathbb{1}^{j-1}} \boxtimes \underbrace{\mathbb{1}^{j} \times \mathbb{1}^{j+1}} \boxtimes \underbrace{\mathbb{1}^{j+2} \overset{\cdots}{\boxtimes} \mathbb{1}^{m}}}$$

$$= \mathbb{1}^{0} \overset{\sharp}{\times} \overbrace{\mathbb{L} \underbrace{\mathbb{1}^{1} \overset{\cdots}{\boxtimes} \mathbb{1}^{m}}} + \overset{m+1}{(-1)} \overbrace{\mathbb{L} \underbrace{\mathbb{1}^{0} \overset{\cdots}{\boxtimes} \mathbb{1}^{m-1}}} \overset{\sharp}{\times} \mathbb{1}^{m} + \sum_{1 \leqslant i \leqslant m} \overset{i}{(-1)} \mathbb{L} \overbrace{\mathbb{1}^{0} \overset{\cdots}{\boxtimes} \mathbb{1}^{i-2} \boxtimes \underbrace{\mathbb{1}^{i-1} \times \mathbb{1}^{i}} \boxtimes \mathbb{1}^{i+1} \overset{\cdots}{\boxtimes} \mathbb{1}^{m}}$$

$$\mathbb{L} dd = 0$$

algebra cyclic (m+1)-cochains

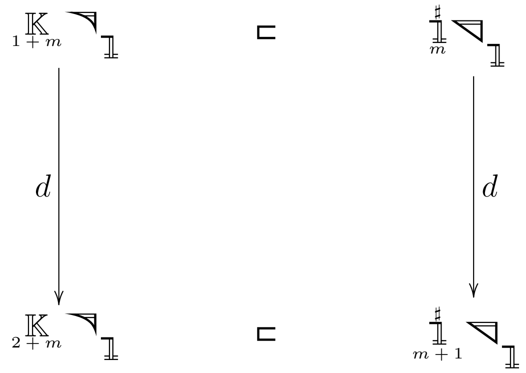
$$\underset{1+m}{\mathbb{K}} \triangledown_{\mathbb{1}} = \frac{\mathbb{K} \xleftarrow{\mathbb{L}} \mathbb{1}^{m+1} \text{ m+1-lin}}{\mathbb{L} \underbrace{\mathbb{1}^{1} \overset{\cdots}{\boxtimes} \mathbb{1}^{m} \boxtimes \mathbb{1}^{0}} = \overset{m}{(-1)} \mathbb{L} \underbrace{\mathbb{1}^{0} \overset{\cdots}{\boxtimes} \mathbb{1}^{m}}}$$

$$\mathbb{L} \in \underset{1+m}{\mathbb{K}} \triangledown_{\mathbb{1}} \sqsubset \underset{m}{\overset{\sharp}{\mathbb{1}}} \triangledown_{\mathbb{1}} \ni \widetilde{\mathbb{L}}$$

$$\overbrace{\widetilde{\mathbb{L}} \underbrace{\mathbb{1}^{1} \overset{\cdots}{\boxtimes} \mathbb{1}^{m}}} \mathbb{1}^{0} = \mathbb{L} \underbrace{\mathbb{1}^{0} \overset{\cdots}{\boxtimes} \mathbb{1}^{m}}$$

$$\underset{m}{\mathbb{K}} \triangledown_{\mathbb{1}} \xrightarrow{d} \underset{1+m}{\mathbb{K}} \triangledown_{\mathbb{1}}$$

$$\underbrace{\mathbb{L} d} \underbrace{\mathbb{1}^{0} \overset{\cdots}{\boxtimes} \mathbb{1}^{m}} = \sum_{j}^{m} \overset{j}{(-1)} \mathbb{L} \overbrace{\underbrace{\mathbb{1}^{0} \overset{\cdots}{\boxtimes} \mathbb{1}^{j-1}} \boxtimes \underbrace{\mathbb{1}^{j} \times \mathbb{1}^{j+1}} \boxtimes \underbrace{\mathbb{1}^{j+2} \overset{\cdots}{\boxtimes} \mathbb{1}^{m}}} + \overset{m}{(-1)} \mathbb{L} \overbrace{\underbrace{\mathbb{1}^{m} \times \mathbb{1}^{0}} \boxtimes \mathbb{1}^{1} \overset{\cdots}{\boxtimes} \mathbb{1}^{m-1}}$$



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