# HIGHER STRUCTURE: EXERCISE 1

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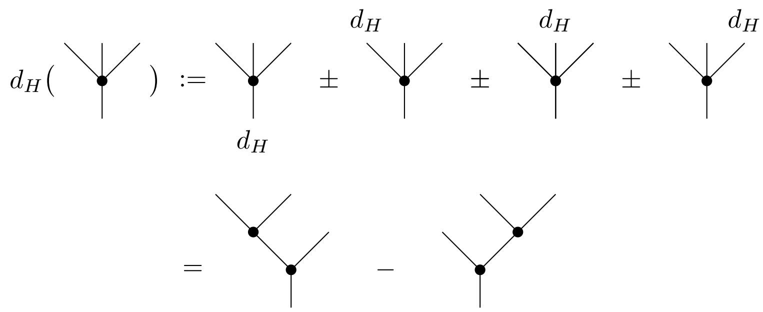
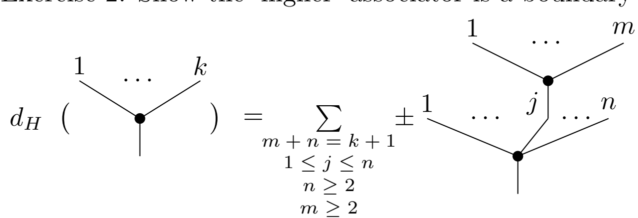
Exercise 1: Show:



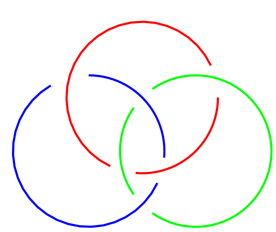

Exercise 2: Show the 'higher' associator is a boundary (of an operation):




Exercise 3: Check $\mathrm{Id}_A - i \circ p = d_A \circ h \pm h \circ d_A$. Hint: LHS $= \mathrm{Id}_{B^n} \oplus \mathrm{Id}_{B^{n+1}}$, and note that under the identification, $d_A^n$ is the following:

$$\begin{array}{ccccccc} A^n \cong B^n \oplus H^n \oplus & B^{n+1} & & & \\ & \big\downarrow \mathrm{Id}_{B^{n+1}} & & & \\ 0 \quad \oplus \quad 0 \oplus & B^{n+1} & \oplus H^{n+1} \oplus B^{n+2} \cong A^{n+1} \end{array}$$

Exercise 4: (Non-compulsory) The following is a plane projection of the Borromean rings. Express the linking numbers as products in cohomology. Any two rings are separable/unlinked, which means products are trivial and makes the classical (3rd) Massey product defined. Show it is non-trivial (they can't be separated).



*Date*: October 15, 2019.