

(Graph homology) $\rightarrow H^*(M)$

Then: 1. Def. of Z_0

2. Proof of invariance mod W.T.

3. A word on signs.

4. Proof of universality.

A word about signs.

$\mathcal{Q}^{-1} = \left\langle \begin{array}{l} \text{v.s. spanned by connected} \\ \text{trivalent } D\text{'s with skeleton } S^1, \\ \text{oriented edges \& ordered } v_i, v_s \end{array} \right\rangle$ / For internal edges: $\rightarrow + \leftarrow = 0$
 re-ordering v_i, v_s acts by the sign of the permutation

Lemma $\mathcal{Q}^{-1} \cong \left\langle \begin{array}{l} \mathcal{Q}^0 \\ \text{trivalent connected with skeleton } S^1, \\ \text{unoriented internal edges,} \\ \text{unordered } v_i, v_s, \text{ but} \\ \text{"oriented internal verts"} \end{array} \right\rangle$ / $\cancel{\rightarrow} + \cancel{\leftarrow} = 0$

Trivalent connected with skeleton S^1 ,
 unoriented internal edges,
 unordered v_i, v_s , but
 "oriented internal verts"