

Group Cohomology – Etudes

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Exercise 1 (tree navigation). Let F be a free group, freely generated by $\{a, b\}$ with $a \neq b$. In “the” 4-regular tree (Figure 1.6), find the vertices corresponding to the following elements of F :

1. $abba$
2. $aba^{-1}b^{-1}$
3. $a^{-2019}b$
4. ab^{2019}

Exercise 2 ((non-)triviality?). Use transfer/functoriality to decide whether the following homology groups are trivial or not (in each of these cases, the action on the coefficients is trivial).

1. $H_{2020}(\mathbb{Z}/2019 \times \mathbb{Z}/2019; \mathbb{Z}/2018)$
2. $H_{2019}(\mathbb{Z}/2018 \times \mathbb{Z}/2018; \mathbb{Z}/2020)$
3. $H_{2019}(\mathbb{Z} \times \mathbb{Z}/2018; \mathbb{Z})$
4. $H_{2018}(\mathbb{Z} \times \mathbb{Z}/2019; \mathbb{Q})$

Exercise 3 (summary). Write a summary of Chapter 1.6 (Changing the resolution) and Chapter 1.7 ((Co)Homology and subgroups), keeping the following questions in mind:

1. What are projective resolutions?
2. How can projective resolutions be used to compute group (co)homology?
3. What are typical examples?
4. What are applications of this approach?
5. How are the (co)homology of subgroups and ambient groups related?
6. Did you check all the little things that we did not discuss in detail in the lectures?

Exercise 4 (save early, save often). And now for something completely different:

1. What is S.M.A.R.T.?
2. How can S.M.A.R.T. be used to make predictions about disk health?
3. Find a good backup solution for your data!

no submission!