

# Group Cohomology – Etudes

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**Exercise 1** (counting quasi-morphisms). Which of the following counting quasi-morphisms on  $\langle a, b \rangle$  are homogeneous? Which are group homomorphisms?

1.  $\psi_a$
2.  $\psi_{a^2}$
3.  $\psi_{ab}$
4.  $\psi_{b^{-1}}$
5.  $\psi_{aba^{-1}b^{-1}}$

**Exercise 2** (functional analysis basics). Recall/loop up the following items from functional analysis:

1. bounded linear operator
2. operator norm
3. Hahn-Banach theorem
4. open mapping theorem

**Exercise 3** (Tor). Recall the following terminology:

1. projective module
2. projective resolution
3. construction/properties of Tor

*Hints.* In case you don't know anything about Tor: Don't panic! I will quickly review the material in the lectures.

**Exercise 4** (summary). Write a summary of Chapter 2.3 (Bounded cohomology) keeping the following questions in mind:

1. What is bounded cohomology of groups?
2. How does bounded cohomology characterise amenability?
3. What are similarities/differences between bounded cohomology and ordinary group cohomology?
4. How does bounded cohomology relate to quasi-morphisms?
5. How do quasi-morphisms relate to stable commutator length?
6. Did you check all the little things that we did not discuss in detail in the lectures?

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no submission!