

# Simplicial Homology

Renzo's math 571

Let us get our hands dirty with simplicial homology. There are two things I want to get you guys familiar with: one is how to compute simplicial homology. The other is to become familiar with homotopy in the category of  $\Delta$ -complexes, and see how one naturally obtains a homotopy of chain complexes for two homotopy equivalent  $\Delta$  complexes.

**Problem 1.** *For the topological space assigned to your group:*

1. *Define a  $\Delta$ -complex structure.*
2. *Write down the chain complex, and the differential maps explicitly.*
3. *Compute all simplicial homology groups.*

**Group 1** *Torus;*

**Group 2**  $\mathbb{RP}^2$ ;

**Group 3** *Klein Bottle;*

**Group 4** *Solid Torus.*

**Problem 2.** *For the pair of homotopy equivalent  $\Delta$ -complexes, construct explicitly homotopies that show that the corresponding chain complexes are homotopy equivalent.*