

**Math 654 - Algebraic Topology**  
**Homework 2**  
**Fall 2019**

1. Find models for the sphere  $S^2$  and torus  $T^2$  as *simplicial* complexes (as opposed to  $\Delta$ -complexes).
  
2. Given the  $\Delta$ -complex structure on the Klein bottle  $K$  described in class, compute the homology groups  $H_*^\Delta(K)$ .
  
3. Let  $X$  be obtained from a simplex  $\Delta^2$  by identifying the three vertices to a single point. Compute the homology groups  $H_*^\Delta(X)$ .
  
4. Build  $S^3$  as a  $\Delta$ -complex, and use this to compute  $H_*^\Delta(S^3)$ .