

## Algebraic Topology

### Homework 2: Due September 8

(This is same as the draft version posted earlier, which is last year's week 2 homework. The cut-and-paste moves for problems 7.2-7.4 can get tedious, and for this I apologize, but I know of no better way to get a feel for the techniques than to actually use them.)

**Problem 1.** Consider a hexagon with opposite edges identified, so that the pattern of edges around the boundary is  $abca^{-1}b^{-1}c^{-1}$ . Which vertices are identified? Using orientability and Euler characteristic, identify this space as either  $S^2$ ,  $\#_n T^2$ , or  $\#_n RP^2$ . Then find an explicit set of cut-and-paste moves that turns the hexagon into the standard model for your answer.

Do problems 7.2 and 7.3 and 7.4 on page 19. Then follow the proof of Theorem 5.1 to convert each of these triangulations into a polygon of standard form. In each case, what surface are we looking at?

Do problems 8.1, 8.8 and 8.9 on page 31. For 8.8 and 8.9, you do *not* need to do a lot of cut-and-paste moves. Orientability and Euler characteristic are enough.