

Homework 1: Due at class on March 8

1. Give an example of a 3-by-3 symmetric non-degenerate matrix without zero entry.
2. Find the Euler characteristic of a surface of genus g (Figure 1).
3. Find the Euler characteristic of a Klein bottle (Figure 2).
4. Find the area of the following triangle (Figure 4) bounded by great circles on a 2-sphere with radius one.
5. Generalize it to the area of n -gon on a 2-sphere with radius one. (An example of a pentagon is drawn in Figure 5.)
6. Prove the Euler characteristic of a 2-sphere is equal to two by using a cell decomposition (Figure 3).

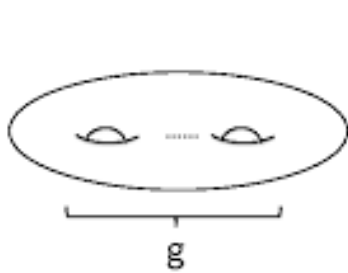


Figure 1: A surface of genus g

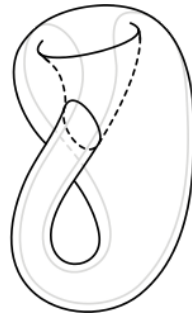


Figure 2: A Klein bottle

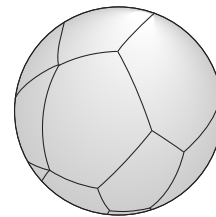


Figure 3: cell decomposition of a 2-sphere

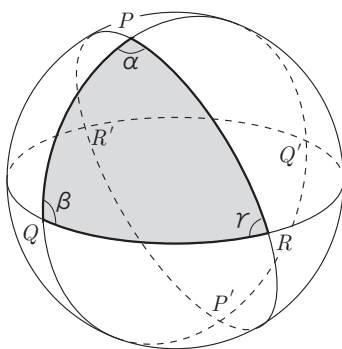


Figure 4: A triangle on a 2-sphere

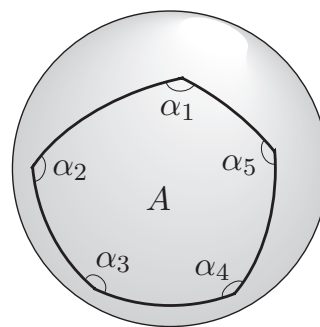


Figure 5: A pentagon on a 2-sphere