Problem 1: Bread Mania - Solution

The main trick to solve this problem lies in the following observation. We can glue two triangulations together by removing one inner face of a triangle in each of the triangulations and then identifying the edges and vertices in the boundary of this triangle. As one can see in the figure 1, these leads to a new Euler characteristic of $\chi(X_1 \oplus X_2) = \chi(X_1) \oplus \chi(X_2) - 2$. Now, by drawing a triangulation of the torus, we find that $\chi(T) = 0$. Similarly, a triangulation of the sphere gives $\chi(S^2) = 2$. Now, to construct a surface with n holes, one simply glues n-toruses to a sphere. From this, it follows that $\chi(T_n) = 2 + 0 + ... + 0 - 2 \cdot n$. So, we see that the number of holes is given by $\chi(X)/2 - 1$.

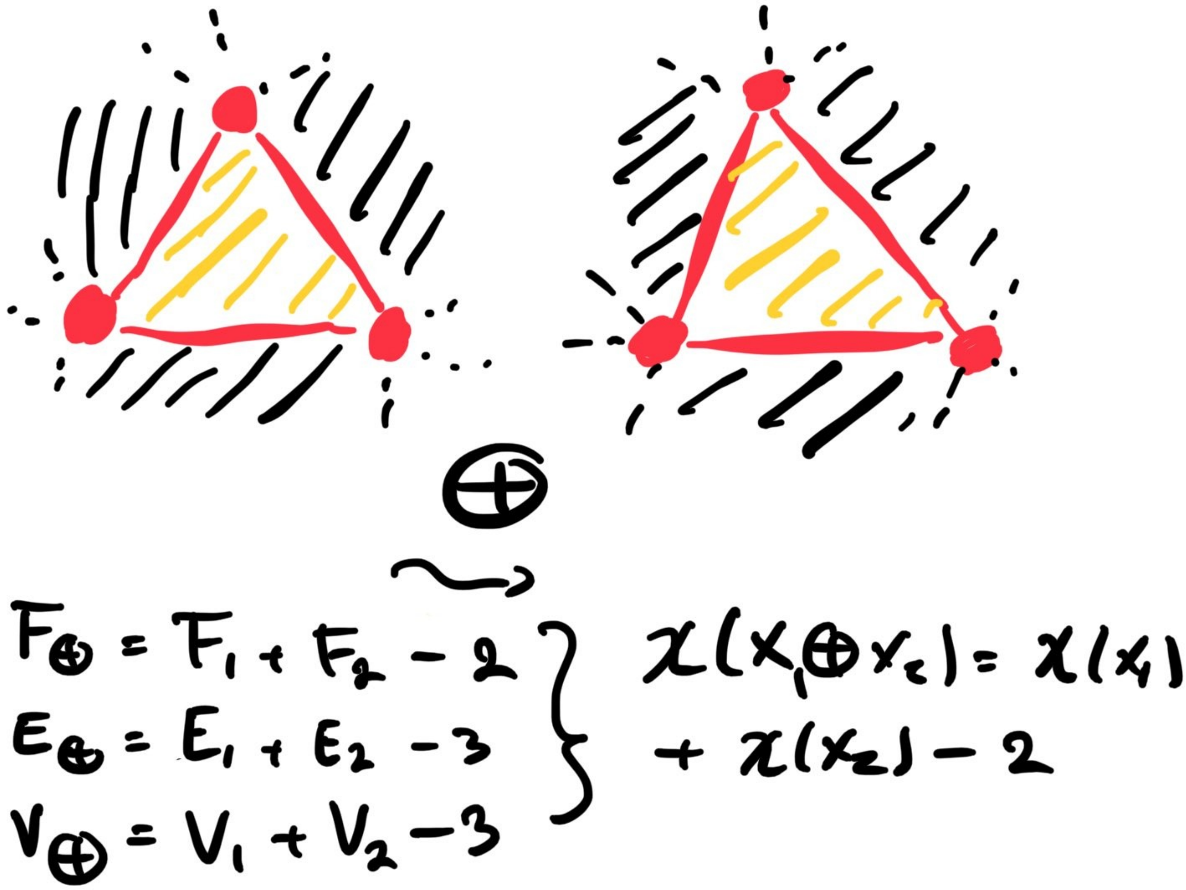

Figure 1: Calculation of the Euler characteristic of the glued surfaces.