

Homework 5

Submission deadline: Monday, November 12.

1 Let G be the skeleton of an octahedron, and abc , any face. Consider the double circle representation of G in which abc is represented by a regular triangle with unit sides. What is the radius of the circle representing the opposite face?

2 Recall from class that for 3-connected planar graph $G = (V, E)$, with infinite face i_0 , we defined $U = V \cup V^* \setminus \{i_0\}$, and for $S \subseteq U$, we defined $J[S] = \{ip \in J : i, p \in S\}$ and

$$f(S) = \frac{1}{2}|J[S]| - |S \cap V^*| - |S \cap (V \setminus \{a, b, c\})| - \frac{1}{6}|S \cap \{a, b, c\}|.$$

Prove that $f(U) = 0$.

3 Let $(C_p : p \in V)$, $(D_i : i \in V^*)$ be a double circle representation of the 3-connected planar graph $G = (V, E)$ in the plane, and x_i be the center of C_i . Prove $(x_i : i \in V)$ can also be obtained as a rubber band representation with appropriate rubber band strengths.