Playsheet 18
Planar Graphs

MATH 130
Tuesday, April 21, 2009

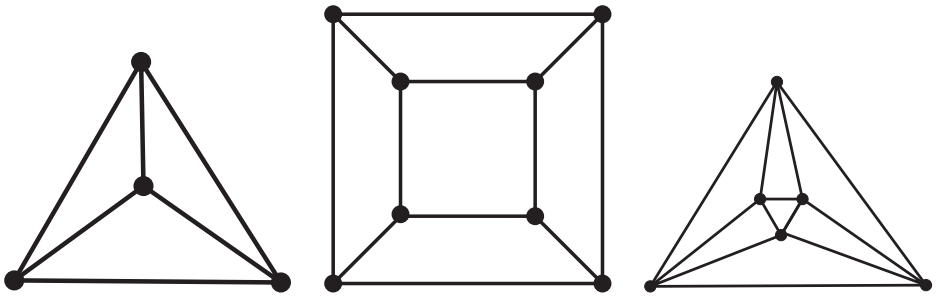
Directions: Work together on each problem; do not delegate different problems to different people. Submit one **neatly written** write-up per group. Remember to use complete sentences as appropriate and to **show your work**.

1. Using several examples, find a relationship among the number of vertices n, the number of edges e, and the number of faces f in a planar graph. (Enter your data in the table on the board and use the class data, too.)

2. Show that K_5 is not planar. Note that I am looking for your argument here, not just a picture! Why **must** every drawing of K_5 have a crossing?

3. The **dual** G^* (pronounced "G-star") of a planar graph G is obtained by placing a new vertex in each face of G and joining vertices of adjacent faces of G. That is, two vertices are joined if the faces of G they represent share an edge.

   Draw the dual of each graph below.



4. Determine the chromatic number of each graph in the previous problem.