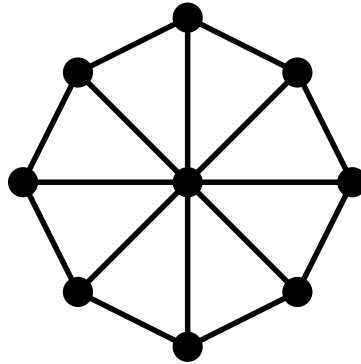


Fall 2015, Math 431: Week 8 Preliminary Problems  
Due: Thursday, October 29th, 2015  
Planar Graphs and Ramsey Theory

**Preliminary problems.** The problems below should be completed before class on Thursday.

- (P1) Find the dual  $G^*$  of the graph  $G$  depicted below (with the given embedding). Find an isomorphism between  $G$  and  $G^*$  (in this case, we say  $G$  is *self-dual*).



- (P2) Find a way to color the *edges* of  $K_4$  so that there are no monochromatic triangles.