2022F Math589 Midterm 2

5 questions, $20(+5)$ **total points**
Note: Use other papers to answer the problems. Remember to write down your **name** and your **student ID #**.

1. [5pt] For each of the following properties, find a graph G satisfying the property:

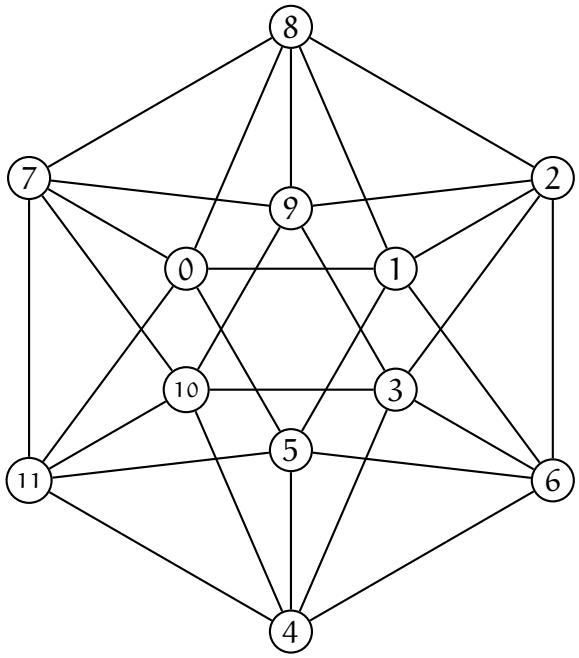
   (a) G is not planar.

   (b) G is planar but not outerplanar.

   (c) G is outerplanar.

   Then **provide your reasons**.

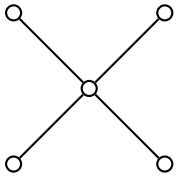
2. [5pt] Let G be the graph below. Find **all** non-separating induced cycles and **one** separating induced cycle.



3. [5pt] Show that every bipartite planar graph with n vertices and m edges must have $m \leqslant 2n - 4$. (Note: A bipartite graph is a graph without any odd cycles.)

Two more problems on the back.

4. [5pt] Let $K_{1,4}$ be the graph below. Find a graph G in $TK_{1,4}$ **with** 9 **vertices** and show it is also a graph in $IK_{1,4}$.



5. [extra 5pt] Let G be the graph below. Find a vertex ordering (e.g., $4, 3, 2, 1, 8, 7, 6, 5$) such that the output of the greedy coloring algorithm based on this vertex ordering uses 4 colors.