Discrete Math - Review for Exam II

Our second exam will be this Thursday, April 27 and will focus on graph theory. Here are some sample problems.

1. (a) What is the largest number of edges possible in a graph with 10 vertices?

   (b) What is the largest number of edges possible in a bipartite graph with 10 vertices?

   (c) What is the largest number of edges possible in a tree with 10 vertices?

2. For the graph G shown in figure 1, write down:

   (a) The order v of G,

   (b) The size e of G,

   (c) The degree sequence of G.

   (d) Verify that the handshake lemma holds for G.

3. Figure 2 shows two isomorphic graphs of degree 5. Find an isomorphism between them by directly indicating which vertices match to which vertices.

4. Show, by example, that it's possible to have two non-isomorphic graphs, both with 5 vertices and 5 edges.

5. A graph has 10 vertices and 30 edges. Explain why it cannot be planar.

6. Verify Euler's identity for the Planar graph shown in figure 3.

7. Indicate how the greedy algorithm would color the graph shown in 4 by labelling each node with colors from the following ordered list of colors: R, Y, B, G, P.

8. Prove, by induction, that a tree always satifies $v = e + 1$.

9. The Mireles graph, shown in figure 5 has 36 edges. Show that it is non planar.
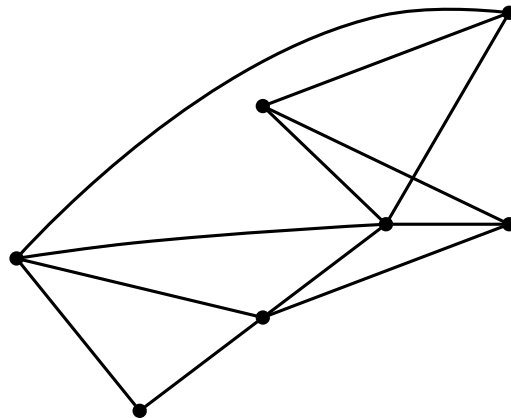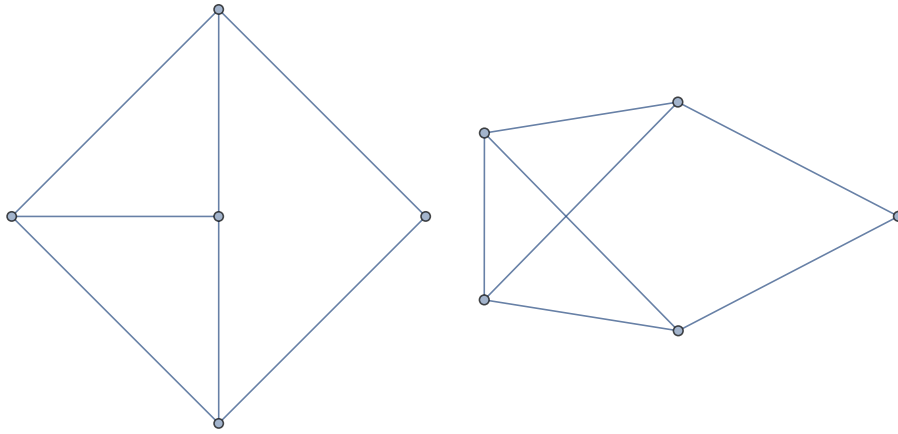

Figure 1: A Graph

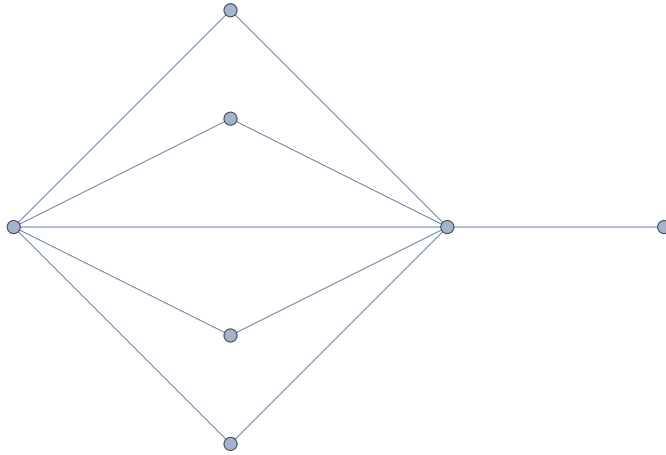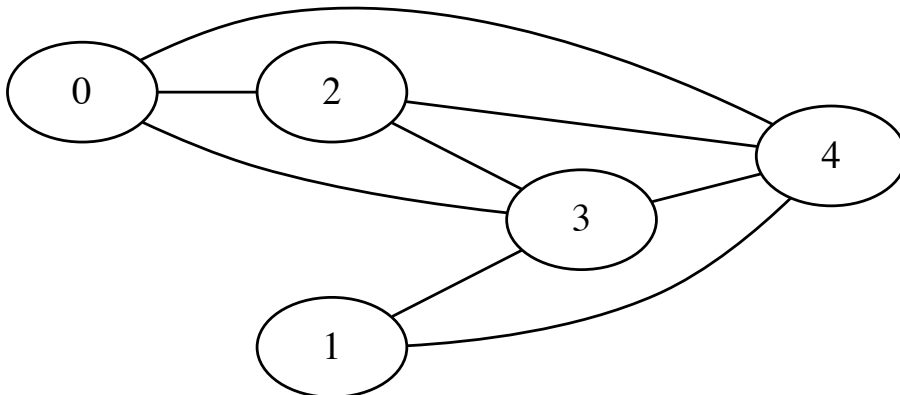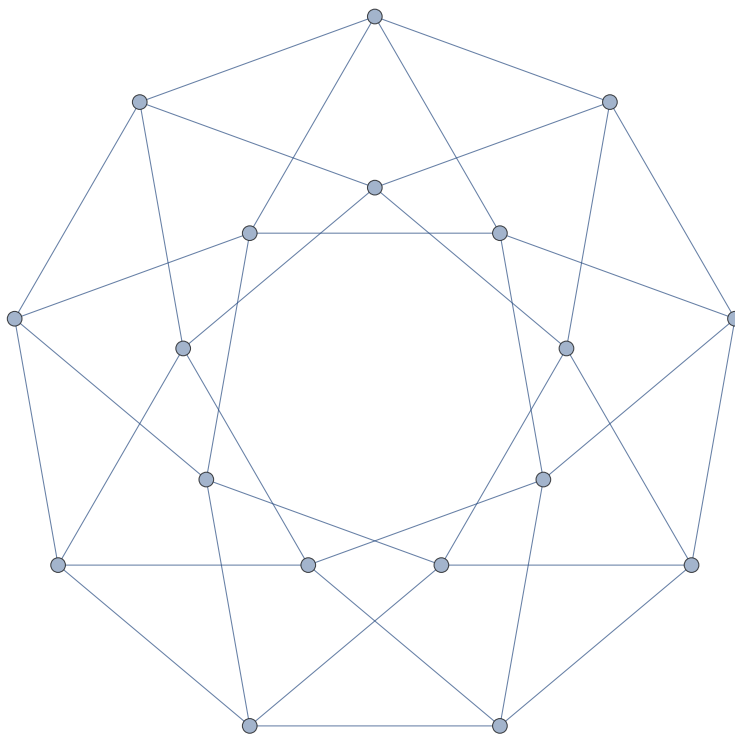Figure 2: Two isomorphic graphs of order 5

Figure 3: A planar graph

Figure 4: A graph for coloring

Figure 5: The Mireles Graph