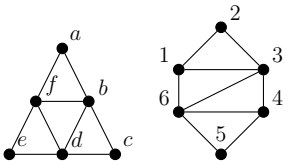
HOMEWORK 6
415G 001 COMBINATORICS AND GRAPH THEORY

DUE FRIDAY 10/30

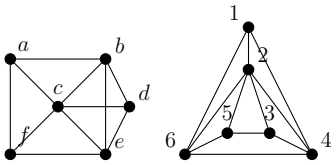
Exercises

1. List all nonisomorphic (not necessarily simple) graphs with 4 vertices.

2. Are the following pairs of graphs isomorphic? Explain why.



(a)



(b)

3. Build six-vertex graphs with the following degrees of vertices, if possible. If not possible explain why not.
   (a) Vertices of degrees $3, 3, 3, 1, 1, 1$.
   (b) Vertices of degrees $1, 2, 2, 3, 4, 5$.
   (c) Vertices of degrees $2, 2, 4, 4, 4, 4$.

4. A graph is called *regular* if all vertices have the same degree. Find all nonisomorphic regular simple graphs with four and five vertices.

5. Suppose all vertices of a graph G have degree d, where d is an odd number. Show that the number of edges of G is a multiple of d.

6. Show that any planar graph can be drawn on the surface of a sphere without crossing edges and vice versa.

7. Suppose a planar graph is not connected but instead consists of several components. Find the appropriate modification of Euler's formula (and prove that your formula holds) for a planar graph with c components.

8. List all the spanning trees of the complete graph with four vertices K_4. How many are there?.

9. Exercise 3.13.

Suggested exercises

From the book. 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.15, 3.16