Due January 20th Choose 5 problems to solve

1.1.3) Using rectangular blocks whose entries are all equal, write down an adjacency matrix for $K_{m,n}$.

1.1.11) Determine the maximum size of a clique and the maximum size of an independent set in the graph below.

1.1.12) Determine whether the Petersen graph is bipartite, and find the size of its largest independent set.

1.1.14) Prove that removing opposite corner squares from an 8×8 checkerboard leaves a subboard that cannot be partitioned into $1/times2$ and $2/times1$ rectangles. Using the same argument, make a general statement about all bipartite graphs.

1.1.15) Consider the following 4 families of graphs: A=paths, B=cycles, C=complete graphs, D=bipartite graphs. For each pair of these families, determine all isomorphism classes that belong to both families.

1.1.19) Determine which of the pairs of graphs are isomorphic.

1.1.21) Determine whether the graphs below are bipartite and whether they are isomorphic.

1.1.23) In each class ((a) all graphs, (b) loopless graphs, (c) simple graphs) determine the smallest n such that there exist nonisomorphic n-graphs having the same list of vertex degrees.

1.1.30) Let G be a simple graph with adjacency matrix A and incidence matrix M. Prove that the degree of v_i is the ith diagonal entry in A^2 and in MM^T. What do the entries in position (i,j) of A^2 and MM^T say about G?

1.1.33) For $n = 5$, $n = 7$, and $n = 9$, decompose K_n into copies of C_n.

1.1.38) Let G be a simple graph in which every vertex has degree 3. Prove that G decomposes into claws if and only if F is bipartite.