Math 777 Homework 2
Due: Feb. 9, before lecture.

1. Determine the crossing numbers of the Petersen graph.

2. Let M_{2n} be the graph obtained from the even cycle C_n by adding chords joining vertices that are opposite. Determine the crossing number $\nu(M_{2n})$.

3. Decompose K_9 into three pairwise-isomorphic planar graphs.

4. Let G be a matching of size n. Select a set of k vertices at a random. Compute the expected number of edges induced by the selected vertices.

5. Prove that some 2-coloring of the edges of $K_{m,n}$ has at least $\binom{m}{r}\binom{n}{s}2^{1-rs}$ monochromatic copies of $K_{r,s}$.

6. By examining common neighbors, prove that if $p > 0$ is fixed and $o(n/\log n)$, then almost every $G(n,p)$ is k-connected.