CS311: **Homework 8** Due in class, 11:15 am, Tuesday, Nov. 4, 2008

Tuesday, Nov. 4 is election day, please make sure to vote!

1. [25 pts.] Do problem 5.13, page 150: Huffman code for A, C, G, and T. What is the percentage decrease of memory needed to store a long string using your Huffman code as opposed to the code A=00, C=01, G=10, T=11?

2. [25 pts.]

   (a) Define an *Eulerian circuit* to be a walk in an undirected graph that starts and ends at the same node and traverses every edge in the graph exactly once. Euler proved that a graph, G, has an Eulerian circuit iff G is connected, and every vertex in G has even degree. Convince yourself that this is true: it's easy to see that the condition is necessary, **Why?** Now suppose that the condition holds. Start at some vertex v and take a walk, deleting each edge after you walk over it, until you reach a point from which there are no remaining edges. You must be back at v, **Why?** It now follows by induction on the number of edges in G that Euler's condition is sufficient, **Why?**

   (b) Using the insights gained by doing (a), give an $O(n+m)$ algorithm which on input the adjacency lists of an undirected graph, G, determines if G has an Eulerian circuit, and if so prints one out. As always, briefly explain why your algorithm is correct and why it has running time $O(n+m)$.

3. [25 pts.] Do Problem 6.3, p. 178: Yuckdonald's.

4. [25 pts.] Do Problem 6.4, p. 178: missing spaces and punctuation. Please also show how to modify your algorithm to be linear tiime under the assumption that all the words in the original string have at most 20 characters.