**Homework 8** Computer Science 310 Due 1 week from pickup

Note that this problem set is cumulative; questions are not just about material we covered recently. Do not discuss problems with anyone but me, and do not search for solutions on the web.

1) Design an O(n) algorithm to find the longest path in an undirected, weighted tree, where all weights are greater than or equal to 0.

2) We will model a system as a directed graph, with vertices corresponding to jobs. Each vertex has a set of edges into it, but vertices are of two types. For type 1 jobs, this job may execute if at least one of the jobs which has an edge to this job has already executed. For type 2 jobs, this job may execute if all the jobs which have an edge to this job have executed. Design and analyze an efficient algorithm for determining whether all jobs can execute.

3) You have a set of n jobs, each of unit length. There are m processors. Each job has a subset of the m processors which can handle the job. You want to find a schedule which minimizes the time of completion of the final job to finish. Design and analyze a polynomial time algorithm to solve the problem.

4) The neighborhood maximization problem takes a graph G and numbers j,k as input, and asks whether there is a set of j vertices which have a combined neighborhood of size at least k. Note that simply taking the j vertices of largest degree will not solve the problem, since many vertices of the set chosen may be adjacent to the same x, and x only counts as one vertex in the combined neighborhood. Show that the neighborhood maximization problem is NP-complete.