Due at the start of class Wednesday, June 29, 2011.

Problem 1. For each pair of expressions (A, B) below, indicate whether A is O, o, Ω, ω, or Θ of B. Note that zero, one or more of these relations may hold for a given pair; list all correct ones.

	A	B
(a)	n^{100}	2^n
(b)	$(\log n)^{12}$	$\sqrt{n}$
(c)	$\sqrt{n}$	$n^{\cos(\pi n/8)}$
(d)	10^n	100^n
(e)	$n^{\log n}$	$(\log n)^n$
(f)	$\log(n!)$	$n \log n$

Problem 2. Let $G = (V, E)$ be a directed graph.

(a) Assuming that G is represented by an adjacency matrix $A[1..n, 1..n]$, give a $\Theta(n^2)$-time algorithm to compute the adjacency list representation of G. (Represent the addition of an element v to a list l using pseudocode by $l \leftarrow l \cup \{v\}$.)

(b) Assuming that G is represented by an adjacency list Adj$[1..n]$, give a $\Theta(n^2)$-time algorithm to compute the adjacency matrix of G.

Problem 3. A connected component of an undirected graph is a maximal subgraph that is connected. One can find the connected components by starting at any vertex, executing BFS, and labeling all of the vertices found as component 1, then starting at some unvisited vertex executing BFS, and labeling all of the vertices found as component 2, etc. Similarly one could use DFS.

(a) Give an algorithm in pseudo code using BFS to label the vertices in each connected component (that runs in $O(m = n)$ time).

(a) Give an algorithm in pseudo code using DFS to label the vertices in each connected component (that runs in $O(m = n)$ time).