HW 2, Due March 7.

1. Say each edge has an integer weight from $[1, n]$ on an $n$-node graph. How much time do the various SSSP and APSP algorithms discussed in the class take? State and prove the complexities.

2. (a) Consider a directed graph $G$ and derive a graph $H$ in which each node $u$ is a strongly connected component comprising set $s(u)$ of nodes in $G$, and there is an edge $(u, v)$ in $H$ if and only if some there is an edge from some node in $s(u)$ to some node in $s(v)$. What is the structure of $H$?

   (b) Do the same as above except let $H$ be formed out of biconnected components of $G$. What is the structure of $H$?

3. Give a linear-time algorithm to to find an odd-length cycle in a directed graph.

4. Give an efficient algorithm that takes as input a directed acyclic graph $G = (V, E)$, and two vertices $s, t \in V$, and outputs the number of different directed paths from $s$ to $t$ in $G$. 