HW7

1) Give an algorithm that determines whether or not a given undirected graph $G = (V,E)$ contains a cycle. Your algorithm should run in $O(V)$ time, independent of $O(|E|)$.

2. Professor Bacon claims that the algorithm for strongly connected components would be simpler if it used the original (instead of the transpose) graph in the first depth-first search. Does this simpler algorithm always produce correct results?

3) Suppose that we represent the graph $G = (V,E)$ as an adjacency matrix. Give a simple implementation of Prim’s algorithm for this case that runs in $O(V^2)$ time.

4) Suppose that all edge weights in a graph are integers in the range from 1 to $|V|$. How fast can you make Kruskal’s algorithm run? What if the edge weights are integers in the range from 1 to $W$ for some constant $W$?