1 (5 points)

Show that a depth-first search of an undirected graph G can be used to identify the connected components of G, and that the depth-first forest contains as many trees as G has connected components. More precisely, show how to modify depth-first search so that each vertex v is assigned an integer label $cc[v]$ between 1 and $k$, where $k$ is the number of connected components of G, such that $cc[u] = cc[v]$ if and only if $u$ and $v$ are in the same connected component.

2 (5 points)

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 $|E|$. 