Problem Set 1

You may discuss the problems with your classmates, however **you must write up the solutions on your own** and **list the names** of every person with whom you discussed each problem.

1 Ocean View (100 pts)

Waikiki has many tall buildings, but only some of them have a clear view of the ocean. Suppose we are given an array $A[1..n]$ that stores the height of n buildings on a city block, indexed north to south (from the Ala Wai Canal to the ocean). Building i has a good ocean view if and only if every building to the south of i is shorter than i.

Consider the following algorithm:

1:   $\textsc{GoodView}(A[1..n])$
2:     initialize a stack S
3:     **for** $i \leftarrow 1$ to n
4:        **while** S is not empty and $A[i] \geq A[\textsc{Top}(S)]$
5:           $\textsc{pop}(S)$
6:        $\textsc{push}(S, i)$
7:     **return** S

(a) **(20 pts)** What is the invariant that ensures that this algorithm correctly computes which buildings have a good ocean view.

(b) **(80 pts)** Use amortized analysis to determine the running time of this algorithm. You may choose either the accounting or the potential method, but you must show your work. (Brownie points for using both methods.)