CSc 345: Analysis of Discrete Structures
Spring 18 (Lewis)

Week 6 Quiz

Solutions

Name: ___________________________ NetID (email): _______________________

Fill in your name and NetID.
Please do not open the quiz until I tell you to do so.

NOTE: This quiz is longer than normal, so you will have 10 minutes to complete it, instead of the normal 5.

Directions: Answer the following questions to the best of your ability. When appropriate, we encourage you to show your work, to help us understand your thought process. Quizzes count toward your grade; please take them seriously.
1. Fill in the following function, which performs the first step of Quicksort (partitioning the array inside the array). For simplicity, you won’t return any information about where the partition is; simply partition the array in-place, and then return.

For simplicity, use element [0] as the pivot; do not use median-of-3. (Your algorithm may assume that the array is not empty.)

Your algorithm must not allocate any memory on the stack.

You may assume that there is a swap() function which you can call, to save time.

Your algorithm must run in $O(n)$ time.

```c
void partition(int[] vals)
{
    Solution:
    int l = 1;
    int h = vals.length-1;
    // loop until the entire array is partitioned
    while (l < h)
    {
        // move the lower bound upwards as far as you can
        while (l < h && vals[l] <= vals[0])
            l++;

        // move the upper bound downwards as far as you can
        while (l < h && vals[h] >= vals[0])
            h--;

        // swap the two values which stopped the advance of the
        // l,h variables.
        if (l < h)
            swap(vals, l,h);
    }

    // swap the pivot into the proper position
    swap(vals, 0,l-1);
}
```