UNIVERSITY OF CALIFORNIA, MERCED

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SANTA BARBARA · SANTA CRUZ

CSE 15: Discrete Mathematics
Homework 5

Spring 2019

Introduction

The purpose of this assignment is to give you some practice with proving order of complexity, as well as proofs by induction. As always, you will also be practicing your LaTeX skills.

Exercises

Create a new LaTeX document and type out the solutions to the following exercises. Your document should include an appropriate title, your name, as well as a date. Please number your solutions appropriately. Upload your `.tex` and your `.pdf` files under the relevant CatCourses assignment.

Complexity Analysis

Derive a complexity function for the following algorithms:

1.
```
def doNothing(someList):
    return False
```

2.
```
def doSomething(someList):
    if len(someList) == 0:
        return 0
    else if len(list == 1):
        return 1
    else:
        return doSomething(someList[1:])
```

3.
```
def doSomethingElse(someList):
    n = len(someList)
    for i in range(n):
        for j in range(n):
            if someList[i] > someList[j]:
                temp = someList[i]
                someList[i] = someList[j]
                someList[j] = temp
    return someList
```

Order of Complexity

Prove the following:

1. $f(n) = 3n + 2 \in O(n)$
2. $g(n) = 7 \in O(1)$
3. $h(n) = n^2 + 2n + 4 \in O(n^2)$

Mathematical Induction

Use mathematical induction to show that the following results hold for all positive integers.

1. $1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$
2. $2 + 2^2 + 2^3 + 2^4 + \ldots + 2^n = 2^{n+1} - 2$