**Sidney Sanders**

CS 4120/5120 Kresman. Homework 2 12 points.

1. Consider a routine for sequential search of the element ABC in an array of size n. What is the best and worst case running times, use O notation.

The best-case would be that the search finds the element on the first check of the list and the run time would O (1). In the worst case, the search would have to execute n times, the entirety of the list and find it in the last item or find that element ABC is not in the list. This would make the worst-case O (n).

1. Theorem: For all non-negative integers n, 1 + 2 + … + n = n (n+1) /2. In class, we used mathematical induction to prove this.

Use proof by contradiction to prove it. SHOW your work! State the assumption you make, the steps that ultimately help contradict the assumption.

We can start by assuming that the theorem is false.

1 + 2 + … + n = n (n+1) /2 🡪1 + 2 + … + n ≠ n (n+1) /2

And try and solve.

Using constant c try and find one less then c

1 + 2 + 3 + … + c-1 🡪 c(c-1)/2

Add c to both sides

1 + 2 + 3 + … + c-1 + c 🡪 c + c(c-1)/2

1 + 2 + 3 + … + c-1 + c 🡪 (c^2-c+2c)2

1 + 2 + 3 + … + c-1 + c 🡪 c(c+1)/2

Replace the constant back with n

c 🡪 n

n(n+1)/2

this contradicts our claim of

1 + 2 + … + n ≠ n (n+1) /2

Proving that in fact…

1 + 2 + … + n = n (n+1) /2