Zachary Neeley
2/20/19
Lab 4
Task 3:

(Base Cases)

This case is used when n(n+1)/2 which will return the value without doing any recursion.

The base case is 0. For this case we know that the formula will be 0(0+1)/2 which will not work returning a zero.

(General Cases)

With the general case we consider that n(n+1)/2 will always return the same value as the recursive call of n + recursiveCall(n-1)/2. The smallest version of n to consider in the general cases are 1. Which this case we know that 1(1-1)/2 which would be 0/2. Knowing this we can see that the with the next value of 2 we know that every lower value has already been tested. Because the two value will always return the same answer we know that the proof is correct.

Task 4:

(Base Cases)

The base case is when n is equal to 0 than the base case will return 0. Once this case is reached the recursion will stop.

(General Cases)

When assuming the base case is 0 we can see that E1, n |(2i – 1) is equivalent to (2n-1) + Ei = 1, n-1|(2i-1). Knowing this we can know that n = 1 so we will return n. Knowing this we can move from 1 to any other number to use induction hypotheses. The program given which is the recursion of n-1, with n getting smaller by 1 every go around. This can be written as n * n or n^2. Knowing this we can prove that n^2 will always return the same value as the recursive call. The proof is complete.

Task 5)

Base Case)

The base cases are -1 and 0 in both the equations given. Only if negative numbers are introduced into the equation. If not than the base case will be 0l=.

General Cases)

We can assume when using induction hypothesis, that if 0 and -1 are passed to the equation than the base cases will be used. We will be looking for any values greater than 0 and less than -1. If this is the case than we can use (Ei = 1, n | i(I +1)) and the equivalent equation of (Ei = 1, n | i^2) which having the lower and upper bound of infinity, but not including -1 and 0.

Since we are given the need equations than we can prove the case by plugging into out equations. If n = 1. Our first equation will give us 1+1 and the other equation which equals 2. We can prove n = 2 assuming that n = 1 is also true using induction hypothesis. Plugging 2 into the first equation you will get 6 out and which is also the same for the section equation. Know this we can check -2 which will give us the proper our put for both the equations. The proof is complete.

Task 6)

Images on next page.

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Task 6) $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$

Task 5)

Base Case $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$

$$\left(\sum_{i=1}^{n} i^2\right) + \left(\sum_{i=1}^{n} i\right) = \frac{n(n+1)}{2} + \frac{n(n+1)(2n+1)}{6}$$

$$= \frac{3(n+1)}{6} + \frac{n(n+1)(2n+1)}{6}$$

$$= \frac{3n+3n+2n^3+3n^2+n}{6}$$

$$= \frac{2n^3+6n^2+4n}{6} = \frac{n^3+3n^2+2n}{3}$$

$$= \frac{n(n+1)(n+2)}{3}$$