Foundations of Computer Science
CS 145
Fall 2015
Homework 1
Due AT THE BEGINNING OF LECTURE Tuesday, September 15

• A general note: When writing up your homework, please explain your arguments clearly and write neatly. Make sure that your proofs are clear, that each step is justified, and that you don’t skip over too many intuitively obvious steps; use only the definitions seen in class or in the book.

Graders may not award credit to incomplete or unclear solutions. Clear communication is the point, on every assignment.

1. Use induction to prove each of the following equations. Each solution must be a proof by induction.

Be sure to write your proofs out carefully! For example, in each proof, be sure to explicitly state what statement is being proved, what the base case is, what the inductive hypothesis is, and where the inductive hypothesis is applied. Use summation notation (i.e., Σ notation) for clarity when appropriate, including the statement to be proved, the base case, and the inductive hypothesis.

(a) 3 + 7 + 11 + ⋅⋅⋅ + (4n − 1) = n(2n + 1).
(b) 5 + 7 + ⋅⋅⋅ + (2n + 1) = (n + 3)(n − 1)

2. Proof the following claim, using the definitions of set operations from class and the textbook.

Claim: For all sets $A, B, C$ and $D$, if $A \subseteq C$ and $B \subseteq D$, then $(A \cup B) \subseteq (C \cup D)$. 