CSCI 3104 Spring 2023
Instructors: Prof. Layer and Chandra Kanth Nagesh

Midterm 1 Standard 1 - Induction

Due Date ..... March 10
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Quiz Code (enter in Canvas to get access to the LaTeX template) ..... **IOOPP**

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1 Instructions

- The solutions **should be typed**, using proper mathematical notation. We cannot accept hand-written solutions. Here's a short intro to LaTeX.
- You should submit your work through the **class Canvas page** only. Please submit one PDF file, compiled using this LaTeX template.
- You may not need a full page for your solutions; pagebreaks are there to help Gradescope automatically find where each problem is. Even if you do not attempt every problem, please submit this document with no fewer pages than the blank template (or Gradescope has issues with it).
- You **may not collaborate with other students**. **Copying from any source is an Honor Code violation. Furthermore, all submissions must be in your own words and reflect your understanding of the material.** If there is any confusion about this policy, it is your responsibility to clarify before the due date.
- Posting to **any** service including, but not limited to Chegg, Discord, Reddit, StackExchange, etc., for help on an assignment is a violation of the Honor Code.

2 Standard 1 - Proof by Induction

2.1 Problem 1

Problem 1. Explain the major components or steps of a proof by induction and how they fit together to prove the correctness of a mathematical claim.

Answer. We have three main steps in a proof by induction. These are 1. the Base Case, 2. the Inductive Hypothesis, and 3. the Inductive Step.

The Base Case is used to show that the minimal cases satisfy what we are trying to prove.

The Inductive Hypothesis is used to show that if earlier cases of what we are trying to prove holds true, then the next case holds true. In the Inductive Hypothesis, we assume that all of these smaller/ earlier cases hold true.

The Inductive Step is the final piece and utilizes the Inductive Hypothesis. We use the Inductive Hypothesis paired with a subsequent case ($n + 1$ commonly) to prove that said subsequent case holds true.

We can view all of these steps like the hypothetical dominoes knocking each other down, with the Base Case being the first or first few dominoes, the Inductive Hypothesis being the next dominoes, and the Inductive Step being the next domino we want to prove will fall down. □