Prep Work 5 - Definitions and Direct Proofs

CS 234

due February 24, before class

0 Introduction

This assignment has 1 part: direct proofs.

This assignment is to be completed individually, but feel free to collaborate according to the course's external collaboration policy (which can be found in the syllabus).

The deliverables consist of one `.pdf` file. The deliverables should be submitted electronically by the deadline. Put any attribution text in the `.pdf` file.

Every file should be named like `FLast_cs234_pX.ext` where `F` is your first initial, `Last` is your last name, `X` is the assignment number, and `ext` is the appropriate file extension. For example, Joan Moschovakis's `.pdf` file should be given the name `JMoschovakis_cs234_p4.pdf`. (Joan Moschovakis is researcher in constructive/computable logic and mathematics. She has studied advanced forms of induction, a technique which you will learn later in this course.)

1 Direct Proofs

Read chapter 7 in the textbook. Then complete the following tasks in your `.pdf` submission. Clearly label your responses with the task number.

1. Restate the 6 tips for writing proofs in your own words.
2. Look at definition 7.2. This definition tells you exactly what condition must be met for the definition of "odd length" to apply to a string s: the existential proposition $\exists n \in \mathbb{N}. |s| = 2n + 1$. We show such an existential is true by providing the concrete n witnessing that $|s| = 2n+1$. With this in mind, use definition 7.2 to argue that the string "hello" is odd length. (Remember the tips for proof writing too!)
3. When trying to prove a statement of the form $P \to Q$ by direct proof, what do we start by assuming, and what do we want to show? (Look back at the start of section 7.3 if you can't remember.)
4. We can also try to prove a statements of the form $P \to Q$ by using direct proof with their contrapositive. What do we start by assuming then, and what do we want to show?
5. We call a set "closed" under some operation when that operation's domain and codomain are both contained within the set. For example, natural numbers are closed under addition. Name two more operations that natural numbers are closed under.