CSCI 2400: Discrete Structures I

Spring 2018 Homework 1

Date: Thurs. 25^{th} Jan. Due Date: Thurs. $1st$ Feb.

You have to solve the following problems and submit them. Make sure all your answer sheets are stapled or otherwise bound together. If you don't understand a problem, feel free to meet me and ask for clarifications.

Any references to page numbers, problem numbers, section numbers etc., refer to the 7th edition of the book. If you have an earlier edition, the references may not be correct. If you are using an earlier edition, make sure to check with one of your classmates who has the 7th edition or myself so that you are solving the correct problems.

Show all intermediate steps and justify any auxiliary claims that you make. Doing so will fetch you partial credit even if your final answer is wrong and not doing so will only fetch you partial credit even if your final answer is correct. Understandability of the solution is as desirable as correctness. You will be graded not only on the correctness of your answer, but also on the clarity with which you express it. Sloppy answers will be at a disadvantage, i.e. likely to receive fewer points.

1. Prove that $((p \longrightarrow q) \wedge \neg q) \longrightarrow \neg p$ is a tautology without using truth tables. Also, do not give a simple English argument. Prove it by using only the logical equivalences learnt in class (all the equivalences from Table 6 and just the first one from Tables 7 and 8). Show all intermediate steps and for each step mention as to what law you are using. (15 Pts.)

2. Prove that $p \longleftrightarrow q$ is logically equivalent to $(p \wedge q) \vee (\neg p \wedge \neg q)$ using the logical equivalences learnt in class (all the equivalences from Table 6, and just the first one from Tables 7 and 8). Do not solve it using Truth Tables or by simple English argument. Show all intermediate steps and for each step mention as to what law you are using. (15 Pts.)

3. Solve Problem No. 36 in page 24 of your text. Assume that there is only one culprit. (10 + 10 = 20 Pts.)