CSCI-246 Discrete Structures HW 4

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Objective

- Understanding proof by contradiction, proof by contradiction, implications, and contra-positive claim of an implication.

- Mathematical definitions.

- How to approach solving a problem.

Submission requirements

- *Type or clearly hand-write* your solutions into a **PDF FORMAT.**

- *DO NOT UPLOAD images.*

- *non-pdf or emailed solutions will not be graded.*

- **If you take pictures of your handwritten homework, put it into pdf format.**

- *Start each problem in a new page.*

- Follow the model that you have learned during the lectures for proofs.

- Do not wait until the last minute to submit the assignment.

- You can submit any number of times before the deadline.

- If you are using latex, and you do not know how to type a symbol, use the following website. You can draw the symbol here and it will give you the latex code and the packages that you have to import. `https://detexify.kirelabs.org/classify.html`

- If you are using latex to write the answer, you can use overleaf to make your life easier. **Overleaf is a free, online platform that helps users create and publish scientific and technical documents using LaTeX, a markup-based document preparation system**

- If you do not understand a problem, ask questions during/after the lectures, or during office hours or via discord.

- Go to TA office hours and talk with them and ask for help.

- *Do not use generative AI to write answers.*

Homework 02 contains **3 questions**.

1 Q1

Recall that for the sets A and B, the claim $A \subseteq B$ is equivalent to the following statement: If $x \in A$, then $x \in B$. (If x is an arbitrary element in the set A, then x is an element of set B.)

1. Write the converse of this implication statement.

2. Write the inverse of this implication statement.

3. Write the contrapositive of this implication statement.

2 Q2

Let S, T and W be sets such that $S \cap T \subseteq W$ and suppose that $t \in T$, then $t \in \overline{S - W}$

1. Write this claim as an implication.

2. Use the proof by contradiction technique to show that this claim is correct.

Hint: First draw a Venn diagram for this relation. This will help you to understand what you have to prove for this claim.

3 Q3

Consider the claim: Let $n \in \mathbb{Z}^{\geq 0}$. If $2n^4 + n + 5$ is odd, then n is even.

1. Write the equivalent contrapositive claim.

2. Use the proof by contrapositive technique to show the given claim is true.