Homework for Math 3210 – 002, Fall 2025

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Our text is by Joseph L. Taylor, Foundations of Analysis, American Mathematical Soceity, Providence (2012). Please read the relevant sections in the text as well as any cited reference. Assignments are due the following Friday, or on April 21, whichever comes first. Your written work reflects your professionalism. Make answers complete and self contained. This means that you should copy or paraphrase each question, provide adequate explanation to help the reader understand the structure of your argument, be thorough in the details, state any theorem that you use and proofread your answer. Homework from Wednesday to Tuesday will be due Friday. Late homework that is up to one week late will receive half credit. Homework that is more than one week late will receive no credit at all. Homework that is turned in not later than 3:00 pm Friday afternoon will be considered to be on time.

Supplementary notes by Anne Roberts, "Basic Logic Concepts," 2005 are available

http://www.math.utah.edu/%7Earoberts/M3210-1d.pdf

Please hand in problems A1 on Friday, Jan. 13.

A1. Truth table. Construct a truth table for the following statement.

$$[P \wedge (P \Rightarrow Q)] \Rightarrow Q.$$

A2. Equivalent Statements. Verify using truth tables that

$$P \wedge [\sim (Q \wedge R)]$$

is equivalent to

$$(P \wedge [\sim Q]) \vee (P \wedge [\sim R]).$$

A3. Quantified Statements. Determine the truth value of each statement assuming that x, y, z are real numbers. Prove your answers.

$$(\exists x)(\forall y)(\exists z)(x + y = z);$$
$$(\exists x)(\forall y)(\forall z)(x + y = z);$$
$$(\forall x)(\forall y)(\exists z)[(z > y) \Rightarrow (z > x + y)];$$
$$(\forall x)(\exists y)(\forall z)[(z > y) \Rightarrow (z > x + y)].$$

A4. Negate and Interpret. Write formally, with quantifiers in the right order. Negate the sentence and interpret the negation as an English sentence.

"Everybody doesn't like something but nobody doesn't like Sara Lee."

A5. Please hand in the following exercises from from Taylor's *Foundations of Analysis*

7[2, 5]

1.1.2 If A, B and C are sets, prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C).$$

1.1.5 What is the intersection of all closed intervals containing the open interval $(0, 1)$? Justify your answer.