Math 330 Section 1 - Spring 2016 - Homework 03

Due date: Thursday, February 4, 2016   *Running total:* 15 *points*
Last submission Thursday, February 4, 2016   ***NO RESUBMISSIONS***
Due dates are in parallel to those of homework 2!

Status - Reading Assignments:

Here is the status of the reading assignments you were previously asked to complete:

B/G (Beck/Geoghegan) Textbook:
   all of ch.1, ch.2 (due Fri, Feb. 5)

Other course material:
   "Sets 1"

New reading assignments:

Reading assignment 1 - due: Monday, February 1(!) Click the link "Logic part 1" in the course materials page of the web site and read the document according to the guidelines I have outlined (only up to the section on NAND and NOR Operators, etc.) Doing so should make understanding of the B/G chapter on logic much easier. As mentioned on the course materials page, try to understand the subject of truth tables. Grasping those concepts will be of great value in following the proofs in the text and in lecture during the entire course. **Most important: sections 1.8-1.10** which cover implication $P \Rightarrow Q$, the basis of all mathematical proofs.

Reading assignment 2 - due: Wednesday, February 3 Read the document "Functions part 1". This chapter just covers the very basics and the terminology. You will study a lot more about functions as the course progresses.

Reading assignment 3 - due: Friday, February 5 Read carefully ch.3 of the textbook on the subject of logic. This chapter is very hard to follow as it is **very condensed**. I feel that you will understand things a lot better and might save some time overall if you do reading assignment 1 before reading ch.3 of the book in depth. Once you've done that first assignment reread ch.3 again. This time try to understand everything!

Be prepared to take a quiz which asks for everything asked for in previous assignments PLUS
   a. the definitions of universal and existential quantifiers plus notation: $\forall, \exists, \exists!$,
   b. ALL SIX alternate ways of english wording to express "A implies B" (check the margins of section 3.2 on implications),
   c. **iff** (double-implication), **converse**, **contrapositive**,
   d. the negation of statements like "A and B", "A or B" and statement with quantifiers

Special recommendation for students for whom English is a second language: You may have an additional barrier to overcome, especially in point b above: It's tricky to understand why "A implies B" is equivalent to "B whenever A" and "A only if B". Try to discuss this with someone of your language background who has some knowledge of abstract Math or with someone for whom English is the first language.

As is true for all the additional readings, be prepared to encounter different notation in that book than what you see in the book and in lecture. In lecture you will see
  $A \setminus B$ instead of $A - B$ for the set difference,
  $A \Delta B$ instead of $A \oplus B$ for the symmetric set difference,
  Ω instead of S or U for the universal set,
  $A^{\complement}$ or A^c instead of $\bar{A}$ for the complement.
Relevant for quizzes and exams: Be able to do assignments like the ones that follow now.

Assignment 1:

This assigment comes in four parts a, b, c, d. All exercises are taken from "Sets part 1" and **not part 2!** They will be **graded only once** like homework you submit in other math courses and **partial credit will be given**. This assignment is worth a total of 8 (**eight!**) points, so make an effort to get everything done.

1a:

Do exercise 1.5.1:

Let $A = \{1, 2, \{1\}, \{1, 2\}\}$. True or false?

(a) $\{1\} \in A$ (c) $\{\{1\}\} \in A$ (e) $2 \in A$ (g) $\{2\} \in A$
(b) $\{1\} \subseteq A$ (d) $\{\{1\}\} \subseteq A$ (f) $2 \subseteq A$ (h) $\{2\} \subseteq A$

1b:

Do exercise 1.6.1:

Let $A = \{1, 2, \{1\}, \{1, 2\}\}$, $B = \{1, \{2\}\}$, $C = \{1, 2, 2, 2\}$, $D = \{5n : n \in \mathbb{R}\}$ and $E = \{5n : n \in \mathbb{Z}\}$.

Find the cardinality of each set.

1c:

Do exercise 1.8.1:

Let $A = \{1, 2, \{1\}, \{1, 2\}\}$ and $B = \{1, \{2\}\}$. True or false?

(a) $2 \in A \cap B$ (b) $2 \in A \cup B$ (c) $2 \in A \setminus B$
(d) $\{2\} \in A \cap B$ (e) $\{2\} \in A \cup B$ (f) $\{2\} \in A \setminus B$

1d:

Do exercise 1.9.1:

Let $A = \{a, b, c, d, e\}$ and let $B = \{1, 2\}$. Find

(1) $B \times A$,
(2) $|B \times A|$.
(3) Is $(a, 2) \in B \times A$?
(4) Is $(2, a) \in B \times A$?
(4) Is $2a \in B \times A$?