M365C: Real Analysis I
Homework # 01
Handout: 01/18/2018, Thursday
Due: 01/25/2018, Thursday

Submission. Please make your homework neat and stapled. Note that *no late homework will be accepted without compelling reasons.*

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1 To be Graded

Problem 1. Let $X = \{1, 2, a\}$. Find the power set of X, $\mathcal{P}(X)$.

Problem 2. For each $n \in \mathbb{N}$, let $A_n = \{(n+1)k : k \in \mathbb{N}\}$. (a) What is $A_1 \cap A_2$? (b) Determine the sets $\cup\{A_n : n \in \mathbb{N}\}$ and $\cap\{A_n : n \in \mathbb{N}\}$.

Problem 3. Let A and B be two sets. Prove that $A \subseteq B$ iff $A \cap B = A$.

Problem 4. Let A, B and C be arbitrary sets. Prove that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

Problem 5. Let $\mathbb{N}$ be the set of natural numbers, and $|$ be the relation of divisibility (i.e. we say $y \in \mathbb{N}$ divides $x \in \mathbb{N}$, denoted by $y|x$, if there exists an integer n such that $x = ny$). Prove that $|$ is an ordering relation on $\mathbb{N}$.

Problem 6. Let $\leq$ be an ordering relation on the set X. We define the inverse of $\leq$, denoted by $\geq$, as follows: $\forall x, y \in X$, $x \geq y$ if and only if $y \leq x$. Prove that $\geq$ is an ordering relation on X.

Problem 7. Let $(X, \leq)$ be a totally-ordered space and $Y \subseteq X$ an nonempty subset of X. Let α be a lower bound of Y and β an upper bound of Y. Prove that $\alpha \leq \beta$.

2 Reading Assignments

- Review Lecture Notes # 1 and #2;
- Review Sections 1.1 and 1.2 of the textbook;