CS311 Quiz#1 (winter 99)

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Problem 1. Given the following sets

$$X_1 = \{a, b, c\}\ , \quad X_2 = \{b, c, d\}\ , \quad X_3 = \{c, d, e\}\ ,$$

find

$$\begin{aligned} X_1 \cup X_2 \cup X_3 &= \{a, b, c, d, e\} \\ X_1 \cap X_2 \cap X_3 &= \{c\} \\ X_1 - X_2 &= \{a\} \end{aligned}$$

Problem 2. Given the sets

$$\begin{aligned} A &= \{n \in \mathbf{N} \mid n = 3k + 1, k \geq 0\}\ , \\ B &= \{n \in \mathbf{N} \mid n = 3k - 2, k \geq 1\}\ . \end{aligned}$$

show that $A = B$. *Hint:* you need to prove $A \subseteq B$ and $B \subseteq A$. $\mathbf{N} = \{0, 1, 2 \ldots\}$ is the set of natural numbers.

Proof.

$A \subseteq B$ Pick $n \in A$. Then $n = 3k + 1$, for some $k \geq 0$. Since $k \geq 0$, we can define $k_1 = k + 1 \geq 1$. Then $n = 3k_1 - 2$, with $k_1 \geq 1$, and by the definition of B we have $n \in B$. Since $n \in A \Rightarrow n \in B$ we conclude $A \subseteq B$.

$B \subseteq A$ Similar as above. Pick $n \in B$. For $k \geq 1$ define $k_1 = k - 1 \geq 0$, etc.