Math 103 Homework Set # 2[1]

Due on March 7, 2006, at 12:30

1) Let $\forall x \in (0,1)$, $\forall n \in \mathbb{Z}$, $N_{x,n} := (n - \frac{1}{x}, n + x)$. Determine

1.a) $$\bigcup_{n \in \mathbb{Z}} N_{\frac{1}{2},n}$$

1.b) $$\bigcap_{n \in \mathbb{Z}} N_{\frac{1}{2},n}$$

1.c) $$\bigcup_{x \in (0,1)} N_{x,0}$$

1.d) $$\bigcap_{x \in (0,1)} N_{x,0}$$

2) Let A, B and C be sets. Prove

2.a) $(A - B) - C \subseteq A - (B - C)$;

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

3) Let A be a set, $\{B_\alpha\}_{\alpha \in \tau}$ be a family of sets, and S is the universal set for A and B_α for all $\alpha \in \tau$. Prove

3.a) $$A \cup \left(\bigcap_{\alpha \in \tau} B_\alpha \right) = \bigcap_{\alpha \in \tau} (A \cup B_\alpha)$$

3.b) $$\left(\bigcup_{\alpha \in \tau} B_\alpha \right)^c = \bigcap_{\alpha \in \tau} B_\alpha^c$$

4) Let A and B be subsets of a set U, and recall that for every set S the power set of S is denoted by 2^S. Prove

4.a) $2^A \subseteq 2^U$;

4.b) $2^{A-B} \neq 2^A - 2^B$.

[1] Each problem will be graded out of 20 points.