Mathematics 300

Quiz 5 Name: Key

You must show your work to get full credit.

1. Let $A_k = \{k-1, k, k+1\}$.

(a) Write out A_3 as a list of elements between brackets.

$A_3 = \{2,3,4\}$

(b) What is $\bigcup_{j=1}^{3} A_j$? $= A_1 \cup A_2 \cup A_3$

$= \{0,1,2\} \cup \{1,2,3\} \cup \{2,3,4\}$

$\bigcup_{j=1}^{3} A_j = \{0,1,2,3,4\}$

(c) What is $\bigcap_{j=1}^{3} A_j$? $= A_1 \cap A_2 \cap A_3$

$= \{0,1,2\} \cap \{1,2,3\} \cap \{2,3,4\}$

$= \{2\}$

$\bigcap_{j=1}^{3} A_j = \{2\}$

(d) What is $\bigcup_{k \in \mathbb{N}} A_k$? $= A_1 \cup A_2 \cup A_3 \cup \cdots$

$= \{0,1,2\} \cup \{1,2,3\} \cup \{2,3,4\} \cup \cdots$

$\bigcup_{k \in \mathbb{N}} A_k = \{0,1,2,3,\ldots\} = \mathbb{N} \cup \{0\}$

2. Let $S = \{1,2,3\}$.

(a) List $\mathcal{P}(S)$ between brackets.

$\mathcal{P}(S) = \{\emptyset, \{1\}, \{2\}, \{3\}, \{1,2\}, \{1,3\}, \{2,3\}, \{1,2,3\}\}$

(b) What is $\bigcup_{A \in \mathcal{P}(S)} A$ = union of the sets in $\mathcal{P}(S)$

$= \emptyset \cup \{1\} \cup \{2\} \cup \{3\} \cup \{1,2\} \cup \{1,3\} \cup \{2,3\} \cup \{1,2,3\}$

$= \{1,2,3\}$

$\bigcup_{A \in \mathcal{P}(S)} A = \{1,2,3\}$

Remark For any set X $\bigcup_{A \in \mathcal{P}(X)} A = X$