

**Math 213, Section B1, Quiz 1 (Solutions); Friday, Jan 18, 2008**

**1.**

Let  $A = \{\emptyset, \{\}, 1, 2, \{\emptyset\}\}$ ,  $B = \{1, 2, 3\}$  and  $C = \{1, \emptyset\}$ .

- (1) Find  $|A|$ ,  $|B|$  and  $|C|$ .
- (2) Find the sets  $A - B$  and  $A \cap C$ .
- (3) Is it true that  $C \subseteq A$ ?
- (4) Is it true that  $\emptyset \in A \times A$ ?
- (5) Is it true that  $(A \cap \mathbf{Z}) \times (A \cap \mathbf{Z}) \subseteq B \times B$ ?

**Solution.**

(1)  $|A| = 4$ ,  $|B| = 3$  and  $|C| = 2$ . Note that  $\emptyset = \{\}$  and that is why  $|A| \neq 5$ .

(2)  $A - B = \{\emptyset, \{\emptyset\}\}$  and  $A \cap C = \{1, \emptyset\}$ .

(3) Yes, it is true that  $C \subseteq A$ .

(4) No, it is not true that  $\emptyset \in A \times A$ . Note that by definition  $A \times A$  consists of all the ordered pairs  $(a, b)$  where  $a, b \in A$ . Thus  $(\emptyset, \emptyset) \in A \times A$  but  $\emptyset \notin A \times A$ .

(5) Yes, it is true that  $(A \cap \mathbf{Z}) \times (A \cap \mathbf{Z}) \subseteq B \times B$ .  
Note that  $(A \cap \mathbf{Z}) = \{1, 2\} \subseteq B$ .