MA181 Week 2 Problems

Lecture 1 Additional Problems

Question 1

Let $A = \{-3, -1, 0, 1, 2, 5\}$ and $B = \{-1, 3, \pi, 5\}$. Calculate the following: -

(i) $A \cup B$;

(ii) $A \cap B$;

(iii) $A \backslash B$;

(iv) $A \triangle B$;

(v) $|A|$;

(vi) $|B|$;

(vii) $|A \times B|$;

(viii) $A \times B$.

Question 2

Let $\mathcal{U} = \{x^2 : x \in \mathbb{N} \, and \, x \leq 7\}$ and $C = \{4, 9, 16\}$. Calculate: -

(i) $\mathcal{U}$;

(ii) $\overline{C}$;

(iii) $|\mathcal{U}|$;

(iv) $|\overline{C}|$;

(v) $\overline{C} \times \overline{C}$.

Question 3

What relation must hold between sets A and B for the following to be true: -

(i) $A \cap B = A$;

(ii) $A \cup B = A$;

(iii) $\bar{A} \cup \mathcal{U} = \emptyset$;

(iv) $\overline{A \cap B} = \overline{B}$.

Lecture 2 Additional Problems

Question 4

Draw a Venn daigram to illustrate $A \triangle (B \triangle C)$. Is the symmetric difference associative? Explain your answer.

Question 5

Use the Laws of Algebra for Sets to prove that $\overline{\left(\overline{A} \cap B\right)} \cap (A \cup B) = A$. State the dual identity.

Week 2 Homework Questions

Question 6

For this question the universal set $\mathcal{U} = \{1, 2, 3, \ldots, 10\}$. Let $A = \{1, 4, 7, 10\}$, $B = \{1, 2, 3, 4, 5\}$ and $C = \{2, 4, 6, 8\}$. Write down explicitly the sets: -

(i) $A \cup B$;

(ii) $A \cap C$;

(iii) $A - B$;

(iv) $\overline{\mathcal{U}}$;

(v) $(A \cup B) - (C - B)$.

Question 7

Declare each of the following true or false and if false explain your reasoning: -

(i) $\{x\} \subset \{x\}$;

(ii) $\{x\} \in \{x, \{x\}\}$;

(iii) $\{x\} \in \{x\}$;

(iv) $\{x\} \subseteq \{x, \{x\}\}$;

(v) $A \times B = B \times A$;

(vi) $\overline{A - B} = \overline{B - A}$;

(vii) $A \cap (B \backslash C) = (A \cap B) - (A \cap C)$;

(viii) $\mathcal{P}(\emptyset) = \{\emptyset\}$;

(ix) $A - (B \cup C) = (A - B) \cup C$.

Question 8

Use the Laws of Algebra for Sets to prove that $(\mathcal{U} \cap A) \cup (B \cap A) = A$, where $A, B \subseteq \mathcal{U}$. State the dual identity.

Question 9

Let $A = \{1, a, x\}$, $B = \{1, b\}$. Write down explicitly the sets: -

(i) $A \times B$;

(ii) $B \times A$;

(iii) $(A \times B) - (B \times A)$.