MA 1126

Assignment 3

1. For the following show \( n \) is an equivalence relation and identify \( X(n) \)

(a) \( X = \{ R \times R \} \) \((x_1, y_1) \sim (x_2, y_2)\) means \( x_1 = x_2 \)

(b) \( X = \{ W \times W \} \) \((a, b) \sim (c, d)\) means \( a + d = b + c \)

(c) \( f: \{ 1, 2, 3, 4 \} \to \{ 0, 1 \} \) by \( f(x) = e^{\pi i/2} \) \( x_1, x_2 \) means \( f(x_1) = f(x_2) \)

2. Prove \( f(A \cap B) = f(A) \cap f(B) \) \( \forall A, B \subseteq X \) \( f \) is 1-1

3. Prove \( f(A) \setminus f(C) = f(A \setminus C) \)

4. Prove \( f(A \setminus B) = f(A) \setminus f(B) \) \( \forall A, B \subseteq X \)

5. Prove \( f(A \setminus B) = f(A) \setminus f(B) \) \( \forall A, B \subseteq X \)

4. Define \( X_A(x) = 1 \) if \( x \in A \)

\( = 0 \) if \( x \notin A \)

called the characteristic function of \( A \).

Show \( : i \) \( X_{A \cup B} = X_A + X_B \)

\( (ii) \) \( X_{A \cap B} = X_A + X_B - X_{A \cup B} \)