Contribution of Problems

1. Let $A = \{a, b, c\}$ and $B = \{a, x\}$. List all elements of

   (a) $A \cup B$

   (b) $A \cap B$

   (c) $A \backslash B$

   (d) $A \times B$

   (e) Power set of A

2. Let $S(n) = \{(x, y) \in \mathbb{R} \times \mathbb{R} \mid max\{x, y\} = n\}$. Prove that $S(3) \cap S(5)$ is the empty set.

3. Let $f : \mathbb{N} \to \mathbb{N}$, given by $f(n) = |n - 4|$.

   (a) Prove that f is surjective

   (b) Prove that f is not injective

4. Make a truth table for not $(A$ or $B) \implies A$ and B. Find a shorter logically equivalent expression.

5. Find the negations of the following statements:

   (a) $(A$ or $B)$ and $(B$ and $C)$

   (b) $A \implies (B$ and $C)$

   (c) $\forall x \; \exists y \; (P(x)$ or $(\text{not } Q(y)))$

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