Observe that the document has spaced out the problems so that there space for comments.

Chapter 1 Problems

1. Prove the second part of Theorem 1.3 DeMorgan's Laws rewritten below.

   Let A and B be sets. Then, $(A \cap B)' = A' \cup B'$.

   Proof: Your proof goes here.

2. Let A, B, and C be sets. Prove that $A \cap (B \backslash C) = (A \cap B) \backslash (A \cap C)$.

   Proof: Your proof goes here.

3. (a) Define a function $f : \mathbb{N} \to \mathbb{N}$ that is one-to-one but not onto.

Example:

(b) Define a function $f : \mathbb{N} \to \mathbb{N}$ that is onto but not one-to-one.

Example:

4. A relation on $\mathbb{Z} \backslash \{0\}$ is defined as $a \sim b$ if $ab > 0$.

(a) Prove the relation is an equivalence relation.

Proof:

(b) Describe the equivalence classes.

      Answer:

5. Define a relation on $\mathbb{R}^2$ by stating that $(a,b) \sim (c,d)$ if and only if $a^2 + b^2 \leq c^2 + d^2$. Show that the relation is reflexive and transitive but not symmetric.

      Answer: