Computer Science & Engineering Department
I. I. T. Kharagpur

Foundations of Computing : CS 300053

3rd Year ID Elective : 5th Semester

Tutorial - I

Goutam Biswas *7th August, 2003*

1. Prove that $A \setminus (B \cup C) = (A \setminus B) \cap (A \setminus C)$.

2. Write *converse* or *contrapositive* of the following statement.

   if x and y are odd then $x - y$ is even.

3. Give a clean proof of the following statement.

   $A = \{m \in \mathbb{Z} : m = 3n + 4, n \in \mathbb{Z}\}$ **is *closed* under multiplcation ($\times$)**.

4. Give a clean proof of the following statement.

   n is an odd integer *iff* x^2 is odd.

5. Let $f : A \longrightarrow B$ be an *onto* map, $|A| = m$ and $|B| = n$. The number of elements of A mapped to the i^{th} element of B be m_i i.e. $\sum_{i=1}^{n} m_i = m$.

   Count the number of *right-inverses* of f.

6. A *relation* R on a A ($R \subseteq A \times A$) is called *symmetric*, if $(a, b) \in R \Rightarrow (b, a) \in R$, for all $a, b \in A$. Let $|A| = n$.

   Count the total number of *symmetric relations* on A.

7. Prove the following statement.

   If A and B are *denumerable* sets, then so is $A \cup B$.

8. Disprove the following statement.

   If A and B are *denumerable* sets, then so is $A \cap B$.

9. Show that two closed intervals on a real line are *equinumerous* i.e. $[a, b] \simeq [c, d]$.

10. Explain *diagonalization* in the proof of $\mathbb{N} \not\simeq \mathcal{P}\mathbb{N}$.