Foundations of Computer Science (COMP109)

Tutorial V (bring solutions between 30.10.2017 – 03.11.2017)

V.1. Let A and B be sets. Prove the following statements.

- $(A \cap B) \subseteq A$
- $A - B \subseteq A$
- $A \cap (B - A) = \emptyset$.
- $(A - B) = A \cap \sim B$.

V.2. Prove or disprove that the set $A \cup (B \Delta C)$ is the same as the set $(A \cup B) \Delta (A \cup C)$.

V.3. List all distinct functions from the set $A = \{1, 2\}$ to the set $B = \{a, b\}$. How many such distinct functions exist?

V.4. Consider $f : \mathbb{R} \to \mathbb{R}$ given by $f(x) = x^2$. What are the domain, codomain and range of f?

V.5. Which of the following functions are injective? Which are surjective?

(a) $f : \mathbb{Z} \to \mathbb{Z}$ given by $f(x) = x^2 + 1$.
(b) $g : \mathbb{N} \to \mathbb{N}$ given by $g(x) = 2^x$.
(c) $h : \mathbb{R} \to \mathbb{R}$ given by $h(x) = 5x - 1$.