Foundations of Computer Science (COMP109)

Tutorial V, Week 16.11.2020 – 20.11.2020

A reasonable attempt at answering Question (V.5.) should be submitted on Canvas by 23:59 on Tuesday 17.11.2020 either as a text entry, a text file (txt), a pdf file, or a photo of the handwritten answer. This assignment makes up 1% of your final mark. We would like to encourage you to discuss the questions with your fellow students in person or on the Canvas discussion board, but do not copy your answer from anybody else.

V.1. What is the cardinality of the set $\{x \in \mathbb{Z} \mid x = y^2; \text{ for some } y \in \mathbb{Z}; -10 \leq y \leq 10\}$

V.2. Determine the power set $Pow(A)$ for

- $A = \{1; 2; L\}$;
- $A = \emptyset$.

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 $h(x) = 5x - 1$.