CS320: Problems for Day 1, Winter 2023

Problem 1 The sets A and B are defined as follows:

$$A = \{a, b, c, d, e\}$$
$$B = \{0, 1, 2\}$$

(a) How many functions are there from set A to the set B?

(b) Construct a function $f_1 : A \to B$. If such a function does not exist, explain why.

(c) Construct an injective function $f_2 : A \to B$. If such a function does not exist, explain why.

(d) Construct a surjective function $f_3 : A \to B$. If such a function does not exist, explain why.

(e) How many partial functions are there from set A to the set B?

Problem 2 Let sets A and B be defined as follows:

$$A = \{a, b, c, d, e\}$$
$$B = \{0, 1, 2\}$$

and let N be the set of natural numbers.

(a) Construct an injective function f_1 from B to $A \times B$. If such a function does not exist, explain why.

(b) Construct a surjective function f_2 from A to a proper subset of N. If such a function does not exist, explain why.

(c) Construct an injective function f_3 from A to $\mathcal{P}(B)$. If such a function does not exist, explain why.

(d) Construct a proper subset S_1 of $\mathcal{P}(B)$ which is infinite. If such a set does not exist, explain why.

(e) Construct a proper subset S_2 of N which is infinite. If such a set does not exist, explain why.