

## 4th Homework sheet Category Theory

- Deadline: 9 May, 13:00 sharp.
- Submit your solutions by handing them to the lecturer at the *beginning of the lecture*.
- Good luck!

**Exercise 1** In this exercise we will call a partially ordered set  $(P, \leq)$  a *tree* if it has a least element and for each  $x \in P$  the set  $\{y \in P : y < x\}$  is finite and linearly ordered by  $\leq$ . If  $(P, \leq)$  is a tree, then we call the size of the set  $\{y \in P : y < x\}$  the *height* of  $x$ . We will consider the category **Tree** where the objects are trees and the morphisms are monotone and height preserving maps.

Note also that we may consider  $\mathbb{N}$  as a category: indeed, we can give it the usual ordering, so it is a poset, and therefore a category as well.

Show that **Tree** and  $[\mathbb{N}^{op}, \mathbf{Sets}]$  are equivalent categories.