

Category Theory Exercises: Week 4

November 2009

These exercises are not compulsory, and they will not contribute to your final grade. Please send your solutions or questions by e-mail to bk291@cam.ac.uk, or leave them in Bartek Klin's pigeonhole next to Reception.

Exercise 1. Prove that if a functor preserves limits then it preserves monos.

Hint: Use Exercise 1 for week 3.

Exercise 2. Given any monoid $(M, \cdot, 1)$, one can define a relation \leq on the set M by:

$$m \leq n \iff \exists k \in M. m \cdot k = n.$$

It is easy to check that \leq is a preorder (i.e., it is reflexive and transitive).

Show how the above construction extends to a functor from the category **Mon** of monoids and monoid homomorphisms to the category **Preord** of preorders and monotonic functions.