Serie 4 - Types in Haskell

Exercise 1

Infer the types of the following functions and say whether they are monomorphic or polymorphic functions. Justify your answer.

a. \(\text{xor } a \ b = a \ && \ \text{not } b \ \| \ b \ && \ \text{not } a\)

b. \(\text{containsChar } c \ s = \text{elem } (\text{toLower } c) \ s\)

c. \(\text{third } (a, \ b, \ c) = c\)

d. \(\text{length } [] = 0\)
\(\text{length } (x:xs) = 1 + \text{length } xs\)

Exercise 2

Some functions can be used with different argument types, but rarely with any type. Consider the following function types, and identify which type is invalid for each function. Justify your answer.

a) \(\text{square :: Int } \rightarrow \text{ Int}\)
\(\text{square :: Float } \rightarrow \text{ Float}\)
\(\text{square :: Char } \rightarrow \text{ Char}\)
\(\text{square :: Double } \rightarrow \text{ Double}\)

b) \(\text{== :: Int } \rightarrow \text{ Int } \rightarrow \text{ Bool}\)
\(\text{== :: String } \rightarrow \text{ String } \rightarrow \text{ Bool}\)
\(\text{== :: (Char, Bool) } \rightarrow \text{ (Char, Bool) } \rightarrow \text{ Bool}\)
\(\text{== :: (Int } \rightarrow \text{ Int) } \rightarrow \text{ (Int } \rightarrow \text{ Int) } \rightarrow \text{ Bool}\)

Exercise 3

\text{Infer} the type of the following function and explain your steps.

\(\text{foldl } f \ z \ [] = z\)
\(\text{foldl } f \ z \ (x:xs) = \text{foldl } f \ (f \ z \ x) \ xs\)