Working Sets - L1

Working Set 1

1) Define the following functions:

f: Z x Z -> Z
f(x, y) = 2x+3y

g: Z x R -> Z
g(x, y) = (x+y)/x + 3

2) Define some functions that have the following type:

f: float -> bool
g: ('a -> bool) -> 'b -> 'b -> 'b

Comment what they do and call them with arbitrary arguments in order to express their functionality.

3) Write a function that calculates the minimum of three given numbers using only if-then-else expressions.

4) Given the code below, determine the type of h without using the REPL. What is the value of the last expression? Explain the phenomenon.

let h x = fun x -> x + 1;;
h 6;;

5) Write a function that composes 3 functions given as arguments (4 arguments: 3 functions + x). Call this function using lambda-functions.

Working Set 2

1) Define the following functions:

f: Z x R -> R
f(x, y) = x+3y

g: R x R -> R
g(x, y) = x^y

2) Define some functions that have the following type:

f: int -> bool
g: string -> int

Comment what they do and call them with arbitrary arguments in order to express their functionality.

3) Write a function that calculates the maximum of three given numbers using only if-then-else expressions.

4) Given the code below, what happens at the definition of function h without using the REPL. What is the value of the last expression? Explain the phenomenon.

let a = 1
let h x = x + a;;
let a = 3;;
h 6;;

5) Write a predicate that verifies whether a function received as an argument is even in a point x (2 arguments: a function + x). Search for what means predicate.

Working Set 3

1) Define the following functions:

f: Z x Z -> Z
f(x, y) = x+3y

g: Z x Z -> Z
g(x, y) = x % y (reminder)

2) Define some functions that have the following type:

f: bool -> int
g: char -> float

Comment what they do and call them with arbitrary arguments in order to express their functionality.

3) Write a function that calculates the median of three given numbers using only if-then-else expressions.

4) Given the code below, without using the REPL, determine the type of the last expression. Explain the phenomenon.

let h x y z = x + y - z;;
let m = h 2;;
m 6;;

5) In mathematics, the + operator was extended also to functions, where (f + g)(x) = f(x) + g(x). Write a function that computes the sum of two functions (which is also a function). Write a more abstract function that also accepts a binary operator that is applied instead of +.

Working Set 4

1) Define the following functions:

f: Z x R -> R
f(x, y) = -6x-2y

g: R x R -> Z
g(x, y) = x*y/(x+y)

2) Define some functions that have the following type:

f: float -> int
g: ('a->'b) -> ('a->bool) -> 'a -> 'b -> 'b

Comment what they do and call them with arbitrary arguments in order to express their functionality.

3) Write a function that calculates the absolute value of a real number using if-then-else expressions.

4) Given the code below, without using the REPL, determine the type of the last expression. What happens when calling h? Explain the phenomenon.

let h x = fun y -> fun z -> x*y;;
h 1 2 ( );;

5) Write a function that receives the coordinates of two points (4 arguments) and computes the line crossing those two points.