CSE 341 — Miranda Discussion Questions

These are questions for discussion in class. (You don’t need to hand in anything.) The solutions are on the class web page.

1. Write a Miranda function to find the cube of a number. What is the type of this function?

2. Write a Miranda function to find the sum of three numbers. What is the type of this function?

3. Write a Miranda function to find the sum of a list of numbers. What is the type of this function?

4. Write a Miranda function to find the maximum of two numbers. What is the type of this function?

5. Write a Miranda function to find the value of the quadratic expression $ax^2 + bx + c$ for parameters $a$, $b$, $c$, and $x$. What is the type of this function?

6. Write a Miranda function to find the two roots of the quadratic equation $ax^2 + bx + c = 0$ for parameters $a$, $b$, and $c$. What is the type of this function?

7. Write a Miranda function to reverse a list. What is the type of this function?

8. Write a function `my_map2` that is analogous to `map` but works for functions of two arguments rather than one. What is its type? For example,

   ```miranda
   map2 (+) [1,2,3] [10,11,12]
   ```

   should evaluate to `[11,13,15]`

9. Tacky true/false questions!

   (a) In Miranda, programs would give the same answers if we replaced lazy evaluation with call-by-name.

   (b) In Miranda, programs would give the same answers if we replaced lazy evaluation with call-by-value.

10. Write a Miranda function to return the infinite list of amounts of money you have every year, assuming you start with $1 and get paid 5% interest, compounded yearly. (Ignore inflation, deflation, taxes, the possibility of collapsing currencies, and other such details.)
11. Suppose that the following Miranda script has been filed in.

\[
\text{plus } x \ y = x+y \\
\text{append } [] \ ys = ys \\
\text{append } (x:xs) \ ys = x : \text{append} \ xs \ ys \\
\text{my\_map2 } f \ [] \ [] = [] \\
\text{my\_map2 } f \ (x:xs) \ (y:ys) = f \ x \ y : \text{my\_map2} \ f \ xs \ ys
\]

What is the result of evaluating the following Miranda expressions? If there is a compile-time type error, or a run-time error, or a non-terminating computation, say so. If the result is infinite, give the first several values. If the expression is followed by ::, then give the type, instead of the value.

(a) plus ::

(b) plus 5 ::

(c) append ::

(d) append [] ::

(e) append [3,4] ::

(f) append [] [3,4] ::

(g) my\_map2 plus ::

(h) my\_map2 append ::

(i) my\_map2 plus [1..] [1..]