CSCI 374 ML Project

Due date: July 9, 2025

How to submit? E-mail your source code and sample result with your findings in one pdf file

1. (15 points) Define a function `rem_duplicate: ''a list -> ''a list` which takes in input a list and takes out all the duplicates. Test your code with sample input and report result.

   Examples:

```
rem_duplicate [] = []
rem_duplicate [1,2,1] = [1,2]
rem_duplicate ["a","a","a"] = ["a"]
rem_duplicate [[1],[1,2],[1,2,3],[1,2],[4,5]] =
               [[1],[1,2],[1,2,3],[4,5]]
```

2. (15 points) Here is an SML `mergesort` program:

```
fun merge([], ys) = ys
|   merge(xs, []) = xs
|   merge(x::xs, y::ys) =
        if x < y then x::merge(xs, y::ys)
        else y::merge(x::xs, ys)

fun split []         = ([],[])
|   split [a]        = ([a],[])
|   split (a::b::cs) =
      let val (M,N) = split cs in
        (a::M, b::N)
      end

fun mergesort []  = []
|   mergesort [a] = [a]
|   mergesort [a,b] = if a <= b then [a,b] else [b,a]
|   mergesort L  =
      let val (M,N) = split L
      in
        merge (mergesort M, mergesort N)
      end
```

Note that `mergesort` includes three base cases (`[]`, `[a]`, `[a,b]`) and all are handled correctly.

Suppose we delete the third line of `mergesort`, so that `[a,b]` is no longer handled as a base case. You can verify that this change makes no difference in the type of `mergesort` or in its behavior.

Now suppose we also delete the second line of `mergesort`, leaving

```
fun mergesort []  = []
|   mergesort L  =
      let val (M,N) = split L
      in
        merge (mergesort M, mergesort N)
      end
```

What effect does this change have on the type that SML infers for `mergesort`?

Verify that whether updated `mergesort` works correctly by running on your system and explain your findings.

You should not copy from others or let other students use your code. Violation to this policy will result in automatic fail.