Midterm 2, CSCI 5535

You have 50 minutes to answer these questions. Please read all questions before you start.

1. **(20 points)** Lackwit implements a polymorphic type inference algorithm. Give an example that illustrates the power of polymorphic type inference (as opposed to monomorphic type inference). Explain in your own words how the example illustrates polymorphic type inference.

2. **(20 points)** The following two statements have sometimes been made by opponents and proponents of static typing: “Programs written in statically typed languages are slower than those written in languages such as C” and “Programs written in statically typed languages can be faster than those written in languages such as C”. In other words, in some situations, static typing has a cost while in other situations, static typing can allow optimizations that would be perhaps very hard to do for languages such as C. Given one example in support of each argument.

3. **(20 points)** Assume that you have a language for which you can correctly find all the pointers in the stack and in the heap. For such a language, give the advantages and disadvantages of each of the three basic collection schemes we looked at in class: reference counting, copying, and mark and sweep. Base your argument on the following criteria: (i) number of instructions to do allocation, (ii) number of instructions to do a garbage collection, (iii) accuracy of collection (i.e., which scheme collects more objects). Note that you don’t actually need to list the number of instructions for each of the collection schemes in parts (i) and (ii); you just need to argue which scheme will use fewer instructions.