How to Submit Homework Assignments
Email your answers, in either plain text format or as pdf, to Abhijit Guria <guria@cs.nyu.edu>. Assignments are due on Wednesdays at 1pm. This deadline will be strictly enforced.

Reading Assignments
• For lecture on 7/19/2007: Scott 7.2.4 (on CD); Cumming (http://www.dcs.napier.ac.uk/course-notes/sml/manual.html)
• For lecture on 7/26/2007: Scott 12.3.4-12.3.5, 12.4.2-12.4.3

Homework Assignments
1. SML (6 = 3 + 3 points)
   While you write the SML code for answering Question 2 below, you will probably get some error messages. Describe two error messages using the following format:
   – Code: a very short piece of code that triggers the error
   – Symptom: the error message itself
   – Cause: an explanation for what triggered the error message
   – Solution: how to fix the code to prevent the error

2. SML (20 = 5 + 5 + 5 + 5 points)
   Write SML programs exercising the fundamental features.
   2a. I/O (5 points)
       Write a program that prompts the user for his or her name, reads the name from input, then politely greets the user by name. Here is an example interactive session:
       What is your name?
       Bob
       Hello, Bob, nice to meet you!
   2b. Libraries (5 points)
       Write a program that uses SML basis library functions to compute $\sqrt{2}$, sin(3.5), and $e^{2.5}$, and then prints the results like this (don’t worry if the numbers are displayed in a slightly different format):
2c. Types (5 points)
The following code creates a variable `c` with the character value ‘Z’, and then prints a description and the value of the variable:

```
let val c = #"Z"
in  print ("name c, type char, value " ^ (Char.toString c) ^ "\n") end;
```

Extend this program by creating and printing more variables of different types. Your program should produce the following output:

```
name b, type bool, value true
name c, type char, value Z
name i, type int, value 42
name r, type real, value 3.141
name s, type string, value hello
```

2d. Control flow (5 points)
Write an SML function `countOccurrences` that takes a pair of parameters, a string and a character, and returns the number of occurrences of the character in the string. For example, `countOccurrences ("hello",="#l")` should return `2`. Do not use a loop, use recursion. Hint: you can use `String.explode` and write a helper function that counts occurrences of a character in a list of characters.

3. Type inference (12 = 3 + 1 + 8 points)
Consider the following SML function:

```
fun a (_, []) = [] | a (n, h::t) = (n+h)::a(n, t);
```

Assume that “+” operates on integers only.

3a. (3 points) Describe in words what `a` does.

3b. (1 points) What is the type of `a`?

3c. (8 points) Show the type inference steps for `a`.

4. Type inference (12 = 3 + 1 + 8 points)
Consider the following SML function:

```
fun addOrMul (oper, x, y) = (if "add" = oper then op + else op * ) (x, y);
```

Assume that the type of “op +” is “int * int -> int”.

4a. (3 points) Describe in words what `addOrMul` does.

4b. (1 points) What is the type of `addOrMul`?

4c. (8 points) Show the type inference steps for `addOrMul`. 

Total points: 50.