

Exercise 1

Due in class (on paper) at 3:30 PM, January 29, 2009.

1. **(20 pts)** Construct tombstone diagrams to illustrate the use of the tools developed in Programming Assignment 1:

- a. compiling a SYNTH program
- b. running a miniSYNTH program

2. **(40 pts)** For each of the following Java program fragments, identify the type of error: Lexical (detected by scanner), Syntactic (detected by parser), Semantic static (detected by semantic analysis at compile time), Semantic dynamic (detected at run time)

- a. `int num = 2.3;`
- b. `int;`
- c. `int@`
- d. `int num1, num2;
num1 = 12;
num2 = num1 / 0;`
- e. `int num;
String str = "dook";
num = str;`
- f. `int int;`
- g. `int num;
if ("unc") { num = 1; }`
- h. `class A {
 private int num;
}
class B {
 A a;
 int num;
 void m() { a = new A();
 num = a.num;
 }
}`

3. (20 pts) Construct an NFA for the following REs

a. $1^*|0$

b. $(10|01)^*1$

4. (10 pts) Ex. 2.1 part (e), pages 96-97 in PLP. Ignore the requirement to group digits with commas.

5. (10 pts) Consider the following “hello world” program in C:

```
#include <stdio.h>

int main(int argv, char *argc[])
{
    printf ("Hello world!\n");
    return 0;
}
```

Log in to the machine `classroom.cs.unc.edu` and create the file `hello.c` containing the code above.

a. Compile the code with the verbose option turned on, as shown below:

```
cc -v -o hello hello.c
```

The compiler gives some output about what it is doing. Attach that output to your homework submission.

b. Compile the code to assembly, as shown below:

```
cc -S hello.c
```

The file `hello.s` will be created containing the assembly code. Attach its contents to your homework submission.