CS2403 Programming Languages

Homework 3

Due: April 19, 2012 in class

1. (50%) Write a C program that contains the following code.

```
int Array1[3];
...
void foo(int x)
{
    int Array2[3], Array3[x], *p;
    ...
    p = Array2;
    ... *(p + 1) ...
    ... Array2[1] ...
    ...
}
```

Generate the assembly code of your C program. (a) Examine and explain how differently the three arrays are allocated by the assembler. (b) Examine and explain how differently the assembler generates code for pointer and array references to the array element `Array2[1]`.

2. (20%) Dynamic type binding is closely related to implicit heap-dynamic variables. Explain this relationship.

3. (30%) In the Tombstone method, the tombstone will remain in the memory even after the corresponding heap-dynamic variable is deallocated. (a) Is it possible to borrow the idea of reference counter in garbage collection to reclaim the memory space occupied by the tombstone? If so, describe how it can be done. (b) Explain what kind of code the assembler may need to generate to implement your method.