CS 6311 – Programming Languages I – Fall 2006
Quiz #6 (20 pts)
Monday, 10/23/6

NAME: KEY

1. In Python strings and user-defined classes are both objects, so explain why modifying a string in Python may be more detrimental to the program execution than modifying a user-defined class? (4 pts)

   In Python strings are immutable objects, this means that every time a string is modified it will be creating a new object and object creation can take time. A user-defined object is a mutable object so depending on what type of data within the object is being modified there may not be any allocation of any objects taking place. Please note: that if the data contained in the object is immutable, e.g. a string field, and it is being modified then object creation will still take place.

2. Given the following lines of C# code, how many objects are created and how many are garbage? (4 pts)

```
int x = 0;
string a = "PL "; // Creates an object
string b = "rocks!"; // Creates an object
string c = a + b; // Creates an object
a = c;    // Does NOT create an object, a and c just point to same string object now, but does
create garbage as what a pointed to "PL" is no longer accessible
a = null;  // No garbage created, because c still reference the object that a point to
b = null;  // No longer a reference pointing to the object that b pointed to, so have a garbage
object
```

Created: 3, Garbage: 2

3. Given the C# code snippet, with an initial call to Main:

```
class Fun {
    private int val = 3;

    static void Main() {
            Fun funOne = new Fun();
            int b = 3;
            int a = 2;
            a = funOne.MyFunc(a, ref b);
            // Location 1

            a = funOne.MyFunc(b, ref a);
            // Location 2
    }

    public int MyFunc(int a, ref int b ) {
            b = val + a;
            val = val + 2;
            a = a + 1;
            return b;
    }
}
```

What is the value of a and b at Location 1 and Location 2? (4 pts)

Loc 1: a = 5, b = 5, Loc 2: a = 10, b = 5

4. Given the following C# code segment, answer the following questions. The Temp property of the Temp class is used to access the double data member that stores the temperature in the object.

```
public void createTemps()
{
      double myTemp = 30.0;
      Temp t1 = new Temp(myTemp);
      t1 = new Temp(myTemp-5);
      Temp t2 = t1;
      t2 = null;
      t2 = new Temp();

      t2.setTemp(75);

      Temp t3 = modifyTemp(t1, myTemp);
      t2.setTemp(myTemp - 10);

      System.out.println("t1: {0}", t1.Temp);
      System.out.println("t2: {0}", t2.Temp);
      System.out.println("t3: {0}", t3.Temp);
      System.out.println("myTemp: {0} “, myTemp);

      t3 = null;
      // HERE
}


public Temp modifyTemp(Temp t2, double myTemp)
{
      myTemp = myTemp + 10;
      t2.setTemp(myTemp);
      return t2;
}
```

a. What is the output of the above code, given an initial call to createTemps? (6 pts)

```
t1: 40
t2: 20
t3: 40
myTemp: 30
```

b. How many Temp objects are garbage when the program reaches the // HERE comment in createTemps? (2 pts)

One