Engineering 101, Winter '05 — Homework 1

Name: ____________________________ uname:__________________ Lab instructor: ____________

This assignment is due Jan 12th either in class or in the course "box" by noon. Late homework is not accepted.

You are to turn in these pages as part of your assignment (rather than using separate sheets), though you are welcome to use additional sheets of paper as needed. All pages must be stapled. This is an individual assignment; all of the work should be your own. Assignments that are unstapled or are difficult to read will lose at least 50% of the possible points and we may not grade them at all.

This assignment is worth about 1% of your grade in the class and is graded out of 50 points. Remember you may drop one homework assignment.

Part I (15 points)

```
main()
{
    int i;
    int j;
    double x;
    double y;

    i=9;
    j=4;
    x=i*j;
    y=i/j;
    // ONE
    x=3.4;
    y=2.2;
    j=x/y;
    y=y+i;
    x=x+y+2;
    // TWO

    i=3; j=2; x=4.0; y=3.0;
    x=i+j*4-4+16*12/(i*j*x)+2;
    y=i-j/i+j;
    // THREE
}
```

Consider the above code. We would like you to try to answer the questions without typing the code into a computer, but it might be a good idea to use a computer to double-check your answer.

1. What are the values of i, j, x and y at the point labeled "ONE"?

2. What are the values of i, j, x and y at the point labeled "TWO"?

3. What are the values of i, j, x and y at the point labeled "THREE"?

4. Which, if any, of your answers would be different if i and j were declared as doubles?

Part II (20 points)

```
#include<iostream>
using namespace std;

int slow_m(int can, int plier)
{
    int i=0;
    int sum=0;

    while(i<can)
    {
        sum=sum+plier;
        i=i+1;
    }
    return(sum);
}
int slow_d(int d1, int d2)
{
    int count=0;
    int total=d2;

    while(total>d1)
    {
        total=total-d1;
        count=count+1;
    }
    return(count);
}
```

```
int slow_mod(int base, int div)
{
    int count=0;
    int total=base;

    while(total>div)
    {
        total=total-div;
        count=count+1;
    }
    return(total);
}

main()
{
    int a;
    a= slow_m(4,8);
    a= slow_m(-3,4);
    a= slow_m(4,-3);

    a= slow_d(12,3);
    a= slow_d(3,12);
    a= slow_d(-5,30);

    a= slow_mod(12,3);
    a= slow_mod(3,12);
    a= slow_mod(-5,12);
}
```

Answer the following questions about the code:

1. What value is returned by the calls to slow_m()?
   a. slow_m(4,8)= ______
   b. slow_m(-3,4)= ______
   c. slow_m(4,-3)=______
2. When slow_d(12,3) is called, what is the value of total when the function exits?

3. One of the slow_d() invocations will "run forever" (not really, but from what we know it will). Which one and why?

4. When slow_d(3,12) is called, what is the value of total at the instant count becomes 2?

5. What value is returned by the calls to slow_mod()?
   a. slow_mod(12,3) = ________
   b. slow_mod(3,12) = ________
   c. slow_mod(-5,12) = ________

Part III (15 points)

```
#include<iostream>
using namespace std;

// Itegration program.  Note that top must be greater than bottom.
double function(double x)
{
    return (x*x);
}

main()
{
    const int COUNT=10;
    const double top =10.0;
    const double bottom =0;
    const double stepsize=(top-bottom)/COUNT;

    int i;
    double step=bottom+(stepsize/2);
    double sum=0;
    double y;

    i=0;
    while(i<(COUNT))
    {
        y=function(step);
        sum=sum+y/COUNT;
        i=i+1;
        step=step+stepsize;
    }
    cout << "Sum= "<< sum*(top-bottom) << endl;
 }
```

1. What will be the value of the variable “stepsize”? Why do you think it has been declared as “const”?

2. What will be the initial value of the variable “step”? ________

3. What will be the value of “step” at the instant the variable “i” is assigned the value 2? _____________

4. If COUNT were instead set to be 2, what would be the value printed by this program?

(This one won’t be counted, but it is useful bit of practice)

5. How would you change this program if you wanted a reasonably accurate value for $\int_{3}^{12} \left(x / (x+1)\right)$? Be specific about exactly how you would change specific lines of code.