Written Assignment II
COP3502H

Due: Monday, 2/19/07 in class

Make sure you show all you work and start early.

From "Data Structures, Algorithms, and Software Principles in C"

1. page 225, #4 (Hint: read over pages 221-222)
2. page 247, #3
3. page 247, #4 (Hint: unrolling and summation is just the substitution method we discussed in class, also see the appendix for help)
4. page 247, #5

Also do these problems

1. Show by mathematical induction that $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$
2. For each of the 6 program fragments, give an analysis of the running time using Big-O notation

a.
```
sum=0;
for (i=0; i<n; i++)
     sum++;
```

b.
```
sum=0;
for (i=0; i<n; i++)
     for (j=0; j<n; j++)
          sum++;
```

c.
```
sum=0;
for (i=0; i<n; ++i)
     for (j=0; j <n*n; ++j)
          sum++
```

d.
```
sum=0;
for (i=0; i<n; ++i)
     for (j=0; j<i; ++j)
          sum++;
```

e.

```
sum=0;
for (i=0; i<n; ++i)
     for (j=0; j<i*i; ++j)
          for (k=0; k <j; ++k)
               sum++;
```

f.

```
sum=0;
for (i=1; i<n; ++i)
     for (j=1; j<i*i; ++j)
          if (j%i == 0)
               for (k=0; k<j; ++j)
                    sum++;
```

Extra Credit Problem

The Sieve of Erastothenes is a method used to compute all primes less than n. We begin by making a table of integers from 2 to *n*. We find the smallest integer, *i* that is not crossed out, print *i*, and cross out *i*, *2i*, *3i*,…. When $i > \sqrt{n}$, the algorithm terminates. What is the running timer of this algorithm?