

# University of Delaware -- Computer and Information Science

## CIS621 -- Homework 1

Handed out: September 1, 2011  
Due date: September 15, 2011

Note: Problem 0 is NOT to be handed in! It is included so that you can see what a solution to a problem might look like. The solution to problem 0 can be accessed via the course webpage.

0. [*Sample Problem*] A **coloring** of the vertices of an undirected graph means that colors are assigned to the vertices such that adjacent vertices have different colors. Prove that if a graph has  $e$  edges, then that graph may be colored using at most  $O(e^{1/2})$  colors.

1. [*Individual Problem*] Evaluate the sums: a)  $\sum_{i=1}^n ia^i$       b)  $\sum_{i=1}^n 2^{n-i} i^2$       c)  $\sum_{i=1}^n iC(n,i)$

Here,  $C(n,i)$  means "the combinations of  $n$  things taken  $i$  at a time"

2. [*Individual Problem*] Explain how to recognize strings of the form  $xww^r y$  in  $O(n^2)$  time, where  $xww^r y$  is a string in the English alphabet (lower case only). Here,  $w^r$  is any permutation of the characters in  $w$ . Note that the size of the alphabet can be treated as a constant when analyzing the time bound. For example, the string  $rtedaffda$  is of the desired form where  $x = rte$ ,  $w = daf$ ,  $w^r = fda$ , and  $y$  is the empty string.

3. [*Individual Problem*] Problem B-3 (parts a and b only) from CLRS (page 1181). Part a is worth 8 points and part b is worth 2 points.