CSci 3501 Assignment 1
Due Wednesday, September 7 in class

Problem 1 (12 points). Please prove or disprove each of the following statements.

A. $n^2 + 5n + 3 \in \Omega(n^3)$

B. $n^2 + 5n + 3 \in \Theta(n^2)$

C. $5 \in O(n)$

D. $5 \in O(1)$

E. $2n^3 + 3 \in \Omega(n^2)$

F. $5n + 2 \in \Theta(1)$

G. $n^2 + 5n + 3 \in o(n^3)$

H. $n^2 + 5n + 3 \in \omega(n^2)$

I. $n^2 + n \log_2 n \in O(n^2)$

J. $n + n \log_2 n \in O(n)$

K. $3 log_2 n \in \Theta(\log_2 n)$

Problem 2 (4 points).

- Prove the following: if $f(n) \in O(g(n))$ and $g(n) \in O(h(n))$ then $f(n) \in O(h(n))$.

- Prove the following: if $f(n) \in \Omega(g(n))$ and $g(n) \in \Omega(h(n))$ then $f(n) \in \Omega(h(n))$.

Problem 3 (4 points). Prove the following:

- $n! \in o(n^n)$

- $g(n) \in o(f(n))$ then $f(n) + g(n) \in \Theta(f(n))$.

Problem 4 (2 points). Exercise 3-4 p. 62 part g. You have to either prove the claim or give a counterexample. Think about the question carefully: the answer is non-obvious.