

## CSci 3501 Assignment 1

Due Fri., Sept. 8 in class

**Problem 1. (10 points)** Please indicate whether each of the following is a true statement. Briefly, but clearly, explain your reasoning.

1.  $n^3 + 5n^2 + 1 \in O(2^n)$
2.  $2n^4 + n \log_2 n \in \Theta(n^5)$
3.  $2n^4 + n \log_2 n \in \Omega(n^5)$
4.  $2n^4 + n \log_2 n \in \Theta(n^4)$
5.  $n \log_2 n \in O(n^2)$
6.  $n \log_2 n \in \Theta(n^2)$
7.  $\log_2 n \in \Theta(n \log_2 n)$
8.  $\log_2 n \in o(n \log_2 n)$
9.  $3n - 1 \in \Omega(1)$
10.  $3n - 1 \in \omega(1)$

**Problem 2 (9 points).**

1. Prove the following: if  $f(n) \in O(g(n))$  and  $g(n) \in O(h(n))$  then  $f(n) \in O(h(n))$ .
2. Find a counterexample to the following: if  $f(n) \in O(g(n))$  then  $2^{f(n)} \in O(2^{g(n)})$ .
3. Prove the following: if  $g(n) \in o(f(n))$  then  $f(n) + g(n) \in \Theta(f(n))$ .

**Problem 3 (20 points).** Problem 1-1 p. 13 in CLRS. The logarithms are base 2. Give a reasonable approximation of the answers.