

# H.W-1.

Q1 Given a function  $20n^3 - 10n \log n - 5$ , verify the following claims.

I.  $20n^3 - 10n \log n - 5 \in O(\log n)$

we need  $c > 0$  &  $n_0 = 1$  such that  $20n^3 - 10n \log n - 5$  for  $n \geq n_0$  this is true for  $c = 8$  &  $n_0 = 2$

Q2  $2^{n+1}$  is  ~~$O(2^n)$~~   $O(2^n)$   
 $= 2^n \cdot 2^1 = 2 \cdot 2^n$  ( $c = 2, n_0 = 1$ )

(3)  $2^{2n}$  is  ~~$O(2^n)$~~   $O(2^n)$   
 $2^{2n} = 2^2 \cdot 2^n = 4 \cdot 2^n$ , ( $c = 4, n_0 = 1$ )  
not  $O(2^n)$

Q3 The worst case time complexity for this code is  $O(n)$ , because  $n$  is just the ~~size~~ ~~of~~ ~~the~~ ~~input~~ what you set it to.

Q4 a)  $2^{60} - 1 = 1.1529215 \cdot 10^{18}$

b)  $\frac{10^{10}}{(2^{60} - 1)}$