CS 261, HW 4

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Due Tuesday, March 19

This homework covers material from Chapter 3.1 through Chapter 4.3 in the textbook.

1. Prove that $n^{1/2}$ is $O(n)$. Don't forget to solve for the correct values of k and C.
2. Prove that $\log n$ is $\Omega(1)$. Don't forget to solve for the correct values of k and C.
3. Describe how the number of comparisons used in the worst case for BubbleSort changes when the size of the list to be sorted doubles from n to 2n
4. Arrange the following functions in a list so that each function is big-O of the next function $\sqrt{n}$, $\log n$, $n^{1.5}$, $n \log n$, $n!$, 2^n.
5. Suppose $f(x)$ is $O(g(x))$. Is it the case that $2^{f(x)}$ is $O(2^{g(x)})$?
6. Exercise 3.2.70, "Let H_n be the n-th Harmonic number..."
7. Exercise 3.3.14, (Horner's Method problem)
8. Show that the following problem is unsolvable: Determine if a given program run on a given input ever outputs the number "42".
9. Prove or disprove that for integers if $a|bc$ then $a|b$ or $a|c$ for integers a, b, c. (Be careful)
10. List 5 integers that are congruent to 1 modulo 12.
11. Which of the following integers are congruent to 2 modulo 7? 2, 3, 16, 14, -2, -10
12. Find $\gcd(123, 277)$ and $\gcd(1349, 1786)$ using Euclid's algorithm. Show your work