CISC4080 Computer Algorithms Homework (1a)[1]

Problem Set 1: Asymptotic Analysis (25 points)

Prove the following statements by finding corresponding c and N (show your details)

1. $n + 10 = O(n)$

2. If $f_1(n) = O(g(n))$, $f_2(n) = O(g(n))$,then $f_1(n) + f_2(n) = O(g(n))$

3. $2n! = O(n^{n})$

4. $\log(n!) = O(n \log n)$

5. $\left\lfloor x + \frac{1}{2} \right\rfloor = \Theta(x)$,where $x > 0$

6. $an^2 + bn + c = \Theta(n^2)$, where $a > 0, b \geq 0, c \geq 0$

7. $n \log n = o(\frac{1}{2}n^2)$

8. $n^3 = o((1.01)^n$

Problem Set 2: Complexity function comparisons (15 points)

Write a program[2] to compute the following time complexity functions values for when $1 \leq n \leq 12$.

$$f_1(n) = \log n$$
$$f_2(n) = n$$
$$f_3(n) = \sqrt{n}$$
$$f_4(n) = n \log n$$

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[1]Distinguish yourselves, folks!

[2]Please feel free to use any programming language you prefer to simulate your ideas

$$f_5(n) = n^2$$
$$f_6(n) = n^3$$
$$f_7(n) = 2^n$$
$$f_8(n) = n!$$
$$f_9(n) = n^{3/2} \log n$$

Note about large n for $n!$

- If you want to try large n (e.g., $n = 15$), C++ will not give your correct answers for $n!$ unless you employ the GMP library http://gmplib.org/ .

- For Java programmers, you can use BigInteger class (java.math.BigInteger) to try very large n easily.

What should you turn in?

1. A hardcopy of all your homework printout in class (Sept 20, 2013).

2. A folder contains all your homework assignments. If there is a programming assignment, you need to include workable source codes and related output in this folder. Please name your folder as first-name_last-name_CISC4080_homework_1. For example, John_Smith_CISC4080_homework_1 if your name is John Smith.

3. Send the zipped file (.zip instead of .rar) of your folder to xhan9@fordham.edu before 11:59 pm Sept 20, 2013.