CSCI2100B– Quiz 1

Name: _____
Student Number: _____

1. For each of the functions $f(N)$ given below, indicate the tightest bound possible. Choose your answer from the following $O(1)$, $O(n^{1/2})$, $O(n^{1/4})$, $O(n)$ $O(n^2)$, $O(n^3)$ $O(n^4)$ $O(n^5)$, $O(n^6)$,$O(n^8)$, $O(n^n)$, $O(\log n)$, $O(\log^2)$, $O(\log^3 n)$, $O(\log^4 n)$, $O(n \log n)$, $O(n^2 \log n)$, $O(n^2 \log n)$, $O(n^2 \log^2 n)$ $O(2^n)$, $O(n^n)$ The logarithmic function is of base 2.
   (a) (5 points) $f(n) = (n \log n + 2n)^2$
   (b) (5 points) $f(n) = \log_{16}(2^n)$
   (c) (5 points) $f(n) = 100 \log \log n + \log n$
   (d) (5 points) $f(n) = n! + 2^n$

2. (a) (20 points) Suppose you are given an array of characters. Write a procedure using stack in pseudocode to check pairs and the orders of "(", ")", are correct in the given expression.
   For example,
   Input: exp = "()()(())" **Output:** TRUE **Explanation:** all the parenthesis are well-formed
   Input: exp = ")()" **Output:** Not Balanced **Explanation:** The first) does not have a (before. And the numbers of '(' and ')' do not match.

3. (a) (20 points) The following numbers are inserted into an empty binary search tree in the given order: 10, 1, 3, 5, 15, 12, 16. What is the height of the binary search tree (the height is the maximum distance of a leaf node from the root)?

4. (a) (20 points) A red-black is a binary search tree that satisfies five *red-black properties*. Try to list them below.