University of Nevada, Las Vegas Computer Science 477/677 Fall 2021

Assignment 1: Due Wednesday January 26, 2022

Name:_____

You are permitted to work in groups, get help from others, read books, and use the internet. Your answers must be written in a pdf file and uploaded to canvas by midnight January 26th.

1. Problem 0.1 on page 8 of the textbook. Write either O, Ω or Θ in each blank. Do not write O or Ω if Θ is correct.

    (a) $n - 100 = \underline{\quad\quad} (n - 200)$

    (b) $n^{1/2} = \underline{\quad\quad} (n^{2/3})$

    (c) $100n + \log n = \underline{\quad\quad} (n + \log^2 n)$

    (d) $n \log n = \underline{\quad\quad} (10n + \log(10n))$

    (e) $\log(2n) = \underline{\quad\quad} (\log(3n))$

    (f) $10 \log n = \underline{\quad\quad} (\log(n^2))$

    (g) $n^{1.01} = \underline{\quad\quad} (n \log^2 n)$

    (h) $n^2 / \log n = \underline{\quad\quad} (n \log^2 n)$

    (i) $n^{0.1} = \underline{\quad\quad} (\log^2 n)$

    (j) $(\log n)^{\log n} = \underline{\quad\quad} (n / \log n)$

    (k) $\sqrt{n} = \underline{\quad\quad} (\log^3 n)$

    (l) $n^{1/2} = \underline{\quad\quad} (5^{\log_2 n})$

    (m) $n 2^n = \underline{\quad\quad} (3^n)$

    (n) $2^n = \underline{\quad\quad} (2^{n+1})$

    (o) $n! = \underline{\quad\quad} (2^n)$

    (p) $\log_2 n^{\log_2 n} = \underline{\quad\quad} (2^{(\log_2 n)^2})$

    (q) $\sum_{i=1}^{n} i^k = \underline{\quad\quad} (n^{k+1})$

2. Work problem 0.3(c) on page 9 of the textbook.

3. Consider the following C++ program.

```cpp
void process(int n)
 {
   cout << n << endl;
   if(n > 1) process(n/2);
   cout << n%2;
 }

 int main()
 {
   int n;
   cout << "Enter a positive integer: ";
   cin >> n;
   assert(n > 0);
   process(n);
   cout << endl;
   return 1;
 }
```

The last line of the output of `process(n)` is a string of bits. What does this bitstring represent?

4. The C++ code below implements a function, "mystery." What does it compute?

```cpp
float squre(float x)
 {
   return x*x;
 }

 float mystery(float x, int k)
 {
   if (k == 0) return 1.0;
   else if(x == 0.0) return 0.0;
   else if (k < 0) return 1/mystery(x,-k);
   else if (k%2) return x*mystery(x,k-1);
   else return mystery(squre(x),k/2);
 }
```