

CSCI B505 – Fall 2018

Written Assignment 1:

Due online Sept. 10 (MON), 2018, 11:59pm EST.

You can use LaTeX, Word, or even pen and paper to write down your answers. But **please try to submit a PDF file**.

Use the formal definitions of big-Oh, etc for the asymptotic complexity questions.

1. Suppose $f(x) = 3x^2 + 5x + 3$ and $g(x) = 2x^3 + x - 100$. Recall the formal definitions of big-Oh. Write down one combination of constants c , n_0 such that $f(x) = O(g(x))$ and explain why you chose those constants.
2. What is the run time for the following function? Justify your answer.

```
int foo(int n){
    int i,j,k=0;
    for(i = n/2; i <= n; i++){
        for(j = 2; j<= n; j = j * 2){
            k += n/2;
        }
    }
    return k;
}
```

3. Show that $f(n) = 1/n \in O(1)$ using the formula.
4. You are given $f(n) = O(g(n))$ and $f(n) = O(h(n))$. Give an example where $g(n) = O(h(n))$ and where $g(n) \neq O(h(n))$
5. Compare the following pairs of functions, and show which one is big-Oh of the other one (prove using the definition): $(n^2, 2^n)$, $(2^n, 3^n)$, $(\log n, \log^2 n)$, $(n^{\sqrt{n}}, n^n)$.