

CS119 – Lab 3

Due Date: March 1

Purpose: An important skill for computer scientists is to be able to look at a program and be able to determine its order of growth. That way we can determine if one solution to a problem is more or less efficient than another solution.

Knowledge: This lab will help you become familiar with the following content knowledge:

- How to determine the order of growth of a function

Task: Follow the steps in this lab carefully to complete the assignments. Copy the BigO.hs file and write out your answers clearly.

Assignment 1:

Take a look at the mysterious function `f1` in the file. Try it out with the following input:

```
> f1 (sent "3 6 7 10 20 23") 10
```

```
> f1 (sent "3 6 7 10 20 23") 11
```

Write out the results of the substitution model for each of the calls above and tell me what this function does. Also, assuming that the length of the sentence is n , tell me what the order of growth would be for this function.

Criteria for Success: You have written out the substitution models and have determined the purpose and order of growth for this function.

Assignment 2:

Take a look at the mysterious function `f2` in the file. Try it out with the following input:

```
> f2 (sent "3 6 7 10 20 23") 10
```

```
> f2 (sent "3 6 7 10 20 23") 11
```

Write out the results of the substitution model for each of the calls above and tell me what this function does. Also, assuming that the length of the sentence is n , tell me what the order of growth would be for this function.

Criteria for Success: You have written out the substitution models and have determined the purpose and order of growth for this function.

Assignment 3:

Take a look at the mysterious function `f3` in the file. Try it out with the following input:

```
> f3 (sent "3 6 7 10 20 23") (sent "10 6 23")
```

```
> f3 (sent "3 6 7 10 20 23") (sent "10 6 11 23")
```

This function uses `f1` (perhaps several times). What is the maximum number of times that `f1` will be called. If the two sentences are roughly the same size, n , what would be the order of growth described in terms of n of `f3` for its worst case given what we know about the order of growth of `f1`?

Criteria for Success: You have explained how you determined the order of growth of `f3`.

Assignment 4:

Take a look at the mysterious function `f4` in the file. Try it out with the following input:

```
> f4 (sent "3 6 7 10 20 23") (sent "10 6 23")
```

```
> f4 (sent "3 6 7 10 20 23") (sent "10 6 11 23")
```

This function uses `f2` (perhaps several times). What is the maximum number of times that `f2` will be called. If the two sentences are roughly the same size, n , what would be the order of growth described in terms of n of `f4` for its worst case given what we know about the order of growth of `f2`?

Criteria for Success: You have explained how you determined the order of growth of `f4`.

Submit your writeup in Canvas for grading.