

Homework 2**Out:** 9.21.16**Due:** 10.3.16

1. [Asymptotic comparison, 25 points]

For each of these problems enter “yes” or “no” indicating whether A is O , o , Θ , ω , Ω of B. Justify your answers.

A	B	O	o	Θ	ω	Ω
$4n \log n$	$n \log n + 5$					
$2^{\log n}$	$(\log n)^2$					
n^n	$n!$					
n	$\sum_{i=0}^{\infty} \frac{50}{7^i}$					
$200 n^9$	e^n					

2. [Asymptotics, 25 points]

Place the following functions from asymptotically smallest to largest. When two functions have the same asymptotic order, put an equal sign between them. Provide an explanation for your ordering.

$$n^5 + 7n, 2^{10}, n \log n, (\log n)^{\log n}, \ln n, n, \sqrt{2}^{\lg n}, 4^{\lg n}, (n+1)!, 2^n$$

3. [Algorithmic intuition, 50 points]

Write and briefly explain the following C++ function:

```
long MaxProduct (string file);
```

that accepts an input file containing sequences of numbers. Each sequence starts on a new line, may continue on several subsequent lines, contains at most 100 numbers, and ends with the number -999999 (which is not part of the sequence).

The function outputs to the screen the maximum continuous sub-sequence product of up to 3 numbers for each sequence, one output per line. It returns the maximum of all the outputs.

Sample input:

```
1 2 3 -999999
-5 -2 2 -30 -999999
6 9 -10 1 -999999
```

Sample output:

```
6
120
54
The overall max product is: 120
```

Your program will be compiled with the provided *HW2_Q3_main.cpp* file on the lab

computers.

Try to make your function as efficient as you can.

Submit your solution, in two files: *MaxProduct.cpp*, containing your function, and *MaxProduct.h*, which is required for your code to compile with the provided main file. Make sure to write your name in a comment at the top of the program, and verify that your program compiles with the provided file on the lab computers.