EL9343 Homework 1

(Due September 20th, 2021)

No late assignments accepted

All problem/exercise numbers are for the third edition of CLRS text book

1. Prove the *Transpose Symmetry* property, i.e., f(n) = O(g(n)) if and only if g(n) = Ω(f(n))

2. Problem 3-1 in CLRS Text book.

3. Problem 3-2 in CLRS Text book.

4. You have 5 algorithms, A1 took $O(n)$ steps, A2 took $\Theta(n \log n)$ steps, and A3 took $\Omega(n)$ steps, A4 took $O(n^3)$ steps, A5 took $o(n^2)$ steps. You had been given the exact running time of each algorithm, but unfortunately you lost the record. In your messy desk you found the following formulas:

(a) $3n log_2 n + log_2 log_2 n$

(b) $3(2^{2log_2 n}) + 5n + 1234567$

(c) $\frac{2^{log_4 n}}{3} + n + 9$

(d) $(log_2 n)^2 + 5$

(e) $3n!$

(f) $2^{3log_2 n}$

(g) $2^{2log_2 n}$

For each algorithm write down all the possible formulas that could be associated with it.

5. For the following algorithm: Show what is printed by the following algorithm when called with MAXIMUM(A, 1, 5) where A = [10, 8, 6, 4, 2]? Where the function PRINT simple prints its arguments in some appropriate manner.

```
MAXIMUM(A, l, r)
1) if (r − l == 0)
2)     return  A[r]
3)
4) lmax = MAXIMUM(A, l, ⌊(l + r)/2⌋)
5) rmax = MAXIMUM(A, ⌊(l + r)/2⌋ + 1, r)
6) PRINT(rmax, lmax)
7) if rmax < lmax
8)     return  lmax
9) else
10)    return  rmax
```