Davie Truong

“I have read and agree to the collaboration policy. Davie Truong”

Homework Heavy

Collaborators: Yona Edell

**Homework 1 Question 2 (Time Complexity)**

**a)**

gacrepqmobhdfsjltikn

j. n^log7 = n^2.8 f. n^2 q. n^1/2

i. 3^n l. 2^log^2 (n) s. 4^logn = n^2

m. 2^logn = n o. n p. 2^log\_4 (n) = n^1/2

t. 1.25^n a. ln(ln n) b. nlogn

h. log(n!) e. log^2 (n) c. 14log\_3 (n) = logn g. summation (1/2)^I = const

r. log(n^2) = logn k. Suma 3^I = 3^n d. summation (i+1)/5 = n^2

**b)**

i. F(n) + g(n) = Omega (Max(f(n), g(n)))

Always True

F(n) + g(n) >= f(n) >= 0

F(n) + g(n) >= g(n) >= 0 therefore,

F(n) + g(n) >= (Max(f(n), g(n)))

Suppose the max of f(n) or g(n) is chosen and the resulting non chosen function is the addition to the current max. ie F(n) + g(n) >= (Max(f(n))). Since f(n) is max, there can be no negative function, and g(n) is an addition to f(n), this makes max f(n) a lower bound to f(n) + g(n) because the function can’t fall any lower than f(n).

ii. f(n) = little omega(g(n)) and f(n) = O(g(n))

Never True

By definition of f(n) = little omega(g(n)), for all constant c > 0 there exist a constant n >= n\_0 > 0

such that 0 < c\*g(n) < f(n)

By definition of f(n) = O(g(n)), there exist a constant c’ > 0 and n >= n\_0’ > 0 such that

0 <= f(n) <= c’ \* g(n)

By having f(n) = little omega(g(n)) and f(n) = O(g(n))

0 < c\*g(n) < f(n) <= c’ \* g(n)

Since f(n) = little omega(g(n)) is true for c = c’

C’ \* g(n) < f(n) <= c’ \* g(n), which is impossible therefore the statement is never true.

iii. Either f(n) = O(g(n)) or f(n) = Omega(g(n)) or both

Always True

By definition, f(n) = O(g(n)) is there exist a c > 0, there exist an n\_o > 0, for all n >n\_o such that

0 <= f(n) <= c\*g(n)

By definition, f(n) = Omega(g(n)) is there exist a c’ > 0, there exist an n\_o > 0, for all n’ >n\_o such

That 0 <= c’\*g(n) <= f(n)

Both being f(n) = theta(g(n)) is the intersection of the two sets ie.

0 <= c’\*g(n) <= f(n) <= c\*g(n)

Therefore, the statement is always true because f(n) can be below an upper bound, above a lower bound, or in-between the upper and lower bound. Being on the bound is also assumed by the definition. Since little o is a subset of big O and little omega is a subset of big Omega, their definition also hold true.