Loc Nguyen

CS.3310.01

Last 4 ID# is 2624

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1. Evaluate and show work
   1. 2 ⎣lg 2081⎦ =2 ⎣11.something⎦ = 211 = 2048
   2. ⎡-458.3⎤ = -458
   3. ⎣lg 9077⎦ = between 8192 and 16384 or between 2^13 and 2^14 = 213

= 8192

* 1. 3 + 6 + 9 + … + 3\*(299) + 3\*(300) = 3\*(1+2+3+4+….+299+300) = 3\*((300+1)\*((300 – 1 + 1)/2))) = 3\*(301\*150) = 135450
  2. Lg (32100000 ) = 100,000\*lg32 = 100,000\*5 = 500,000

1. Rank functions by order of growth (least to greatest)

\*\*\*if on the same line, functions has same order of growth

* 1. Lg(lg n)
  2. ln n < lg n
  3. 33n < n + 20
  4. n lg n
  5. 11n2 < 55n2 + n
  6. 77n3
  7. n3+ε where 0<ε<1
  8. n5 + 23 < 555n5 – n3 + n2
  9. 2n-4  < 2n
  10. en
  11. N!

1. Verify the following questions. Justify your answer
2. 5n2 - 2n = q(n2)

5\*n2 ≥ 5n2 – 2n for " n ≥ 0 since 5n2 – 2n will also be equal to or less than 5n2. So C2 can be 5

4\*n2 ≤ 5n2 – 2n for " n ≥ 2 since if n = 1, 4 ≤ 3 which is false, and if n=2, 16 ≤ 16 which is valid. Since 5n2 will grow faster than 4n2, any n ≥ 2 will be valid. C1 will be 4

The overlap means that n0 = 2

Therefore, c1 = 4, c2 = 5, and n0 = 2. So, 5n2 - 2n = q(n2) is true.

b) 4n2 = W(1)

4n2 ≥ c \* 1 for " n ≥ 1 since when n = 1, 4 > 1 and since 4n2 grows faster than 1, any n > 1 will be valid.

Therefore, c = 0 and n0 = 1. So, 4n2 = W(1)

c) 4n = O(n!)

Show that 4n ≤ c \* n! for " n ≥ n0. Testing of values shows that 49 < 9! so n ≥ 9 will be valid since factorial function grows faster than exponential function 4^n because this function consistently increase by a factor of 4 whereas the factorial functions increase by an increasing factor greater than 4. Constant c can be 1.

Therefore, c = 1 and n0 = 9. So, 4n = O(n!) is true

d) 77 n! = O (nn)

Show that 77 n! ≤ c \* nn for " n ≥ n0. Testing some values shows that when n = 7, 77 (7!) ≤ 1 \* 77 = 388,080 ≤ 823,543 so n ≥ 7 will be valid since nn will grow faster than the factorial function. This is because the nn function will increase in base and exponential power whereas the factorial function only increase by a factor of n+1. Constant c is 1.

Therefore, c = 1 and n0 = 7. So 77 n! = O (nn) is true.