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CS312 Algorithms  
Hausner

Assignment 1

1.List the ranking of the following functions in highest asymptotic order (Highest to lowest)

* N!
* 2n, 2n-1
* (3/2)n
* N-n2+5n3, n3, n3+lg n
* N2
* N log(n)
* N
* N1/2 =
* Lg n = log2 n, lg(lg(n)), lg(n)2
* 6

2. Find the reccurence Relation for the Addition of a Fibbonnacci Series

A(0) = 0

A(1) = 0

A(2) =0

A(3)=1+0+0

A(4)=2=1+1

A(5)=4=2+1+1

A(6)=7=4+2+1

A(7)=12=7+4+1

Therefore:

A(n) = 1+A(n-1)+a(n-2) for A(3) = 1 and A(x) where x < 3 A(x) = 0

3. Obtain the closed form formulas of the following recurrence relations

a) T(n) = 3 T(n-1) – 1 T(1) = 1

T(n) = 3 ( 3 T(n-2) – 1) -1 = 32 \* T(n-2) – 3 – 1 = 32 \* T(N-2) – 4

T(n) = 32 (3 T(n-3) – 1) – 3 – 1 = 33 \* T(n-3) – 9 – 3- 1

T(n) = 33 \* (3 T(n-4) -1 ) -9 -3 -1 = 34 T(N-4) – 27 – 9 – 3 – 1

T(n) = 3k \* T(N-K) -

K = N-1

T(N) = 3N-1 \* T(N-N+1) - => 3n-1 \* 1 \* => 3n-1 \* =>

T(N) = =

b) T(N) = T(N-1) + N – 2 T(1)=1

T(N) = (T(N-2) + (N-1) – 2) – 2 = T(N-2) – 2(N-2) – 1

T(N) = (T(N-3) + (N-2) – 2) – 2(N-2) – 1 = T(N-3) + 3(N-2) – 2 – 1

T(N) = (T(n-4) + (N-3) – 2) – 4(N-2) – 3 -2 -1 = T(N-4)+ 4(N-2) – 3 – 2 – 1

T(N) = T(N-K) + K(N-2) -

K=N-1

T(N) = T(N-N+1) + (N-1)(N-2) - => T(1) + N2-3N+2 -

T(N) = 1 + N2-3N+2 - => N2-3N+3 - =>

c) T(n) = 3\*T(n/3)+2n2 for n is a power of 3 T(1) = 1

T(n) = 3( 3\*T(n/32) + 2(n/3)2 ) + 2n2 = 32 \* T(n/32) + 6(n2/32) + 2n2

= 32 \* T(n/32) + (2n2/3) + 2n2

T(n) = 32( 3 \* T(n/33)+ 2(n/32)2) + 3\*2\*(n/3)2 + 2N2

T(n) = 33 \* T(N/33) + 32\*2\*(n/32)2 + 3\*2(n/2)2 + 2N2

T(n) = 3k \* T(n/3k) + 2N2 \*

K = log3N

T(n) = 3log3(N) \* T(n/3log3(n)) + 2N2 \*

=>N \* 1 + 2N2 \* => N + 2N2() => N + 2N2()

=>N + 2N2( ) => N + 2N2() => N + N2\* => N + N\* 3N-3

=>N + 3N2 – 3N = 3N2 – 2N

4. Use the master Method to find the approximate solution to recurrence relations:

a) T(n) = 4\*T(n/4)+n-3

a=4 b = 4 c = 1

bc = a : Θ(NclogN) = Θ(N log N )

b) T(n) = 8 \* T(n/3) + n2 + 4

a = 8 b = 3 c = 2

bc > a : Θ(Nc) = Θ(N2)

c) T(n) = 2 \* T(n/6) + n2 + 4

a = 2 b = 6 c = 2

bc > a : Θ(Nc) = Θ(N2)

d) T(n)= a(n-1) + a(n-2) + 1

a=1 b = 1 c = 1

bc = a : Θ(NclogN) = Θ(N log N )

5. (See Attached)