RECURRENCE RELATION

$T(n) = T(n-1) + n^2$ A

Solution:

Iteration 1:

Put n=n-1, then

$T(n-1) = T(n-2) + (n-1)^2$ B

Put the value of T(n-1) from B to A, then

$T(n) = T(n-2) + (n-1)^2 + n^2$ C

Iteration 2:

Put n=n-2 in A, then

$T(n-2) = T(n-3) + (n-2)^2$ D

Put the value of T(n-2) from D to C, then

$T(n) = T(n-3) + (n-2)^2 + (n-1)^2 + n^2$ E

Iteration 3:

Put n=n-3 in A, then

$T(n-3) = T(n-4) + (n-3)^2$ F

Put the value of T(n-3) from F to E, then

$T(n) = T(n-4) + (n-3)^2 + (n-2)^2 + (n-1)^2 + n^2$ G

RECURRENCE RELATION

Iteration 4:

Put n=n-4 in A, then

$T(n-4) = T(n-5) + (n-4)^2$ H

Put the value of T(n-4) from H to G, then

$T(n)=T(n-5)+(n-4)^2+(n-3)^2+(n-2)^2+(n-1)^2+n^2$ I

Now, for "k" terms, it will be

$T(n)=T(n-k)+n^2 + (n-1)^2 + (n-2)^2 + (n-3)^2 + (n-(k-1))^2$

$T(n)=T(n-k) + n^2 + (n-1)^2 + (n-2)^2 + (n-3)^2 + (n-k+1)^2$

$T(n) = T(n-k) + (n^2+ n^2+ n^2+ n^2+\ldots\ldots+n^2$ for k times) – discarded values

Assume;

n-k = 0 (zero), n=k and T (0) = 0 (zero), then

$T(n) = n^2 * k$

$T(n) = n^2 * n$ as n=k assumed

$T(n) = n^3$

Answer: $T(n) = O(n^3)$

Homework: Solve T(n) = 2T(n-1) + 1