Note:

1<logn<< n<nlogn<n2<n3<…….<2n<3n<nn

Mathematical Analysis of Recursive Algorithms

Q1: void Test(int n)

{

If (n>0)

{

Print (n)

Test(n-1)

}

}

Q2: void Test(int n)

{

If (n>0)

{

For(i=0;i<n;i++)

{ Print (n) }

Test(n-1)

}

}

Q3: void Test(int n)

{

If (n>0)

{

For(i=0;i<n;i=i\*2)

{ Print (n) }

Test(n-1)

}

}

T(n)=T(n-1)+1 🡪 O(n)

T(n)=T(n-1)+n 🡪 O(n2)

T(n)=T(n-1)+logn 🡪 O(nlogn)

We can conclude:

T(n)=T(n-1)+n2 🡪 O(n3)

T(n)=T(n-2)+1 🡪 n/2 🡪O(n)

T(n)=T(n-100)+n 🡪 n2/100 🡪O(n2)

T(n)=2T(n-1) + 1 🡺 ???

Q4: void Test(int n)

{

If (n>0)

{

Print (n)

Test(n-1)

Test(n-1)

}

}

T(n)=T(n-1)+1 🡪 O(n)

T(n)=T(n-1)+n 🡪 O(n2)

T(n)=T(n-1)+logn 🡪 O(nlogn)

T(n)=T(n-1)+n2 🡪 O(n3)

T(n)=T(n-2)+1 🡪 n/2 🡪O(n)

T(n)=T(n-100)+n 🡪 n2/100 🡪O(n2)

Now

T(n)=2T(n-1) + 1 🡺 O(2n)

T(n)=3T(n-1)+1 🡪 O(3n)

T(n)= 2T(n-1)+n 🡪 O(n2n)

T(n) = 3T(n-1)+logn 🡪 O(3n X logn)

T(n) = T(n/2) + 1 ----???

Q5: Algorithm Test ( int n)

{

If(n>1)

{

Print (n)

Test(n/2)

}

}

Q6: Algorithm Test ( int n)

{

If(n>1)

{

For(i=0;i<n;i++)

{ Print (n) }

Test(n/2)

}

}

Q7: Algorithm Test ( int n)

{

If(n>1)

{

For(i=0;i<n;i++)

{ Print (n) }

Test(n/2)

Test(n/2)

}

}

T(n)=T(n/2) + 1 🡺 O(logn)

T(n)=T(n/2) + n 🡺 O(n)

T(n)=2T(n/2)+n 🡪O(nlogn)

Q8: Algorithm Test ( int n) **(HW)**

{

If(n>1)

{

Print (n)

Test()

}

}