

1. Order the following functions on the basis of their growth rates:
 $\log \log n, \log n, \log^2 n, \sqrt{n}, n, n \log n, n^2, n^3, 2^n, e^n, 3^n$.
 2. Consider the Fibonacci function $F(1) = 1, F(2) = 2$ and $F(n) = F(n-1) + F(n-2)$. Prove that $F(n)$ is $\Omega((3/2)^n)$ and $F(n)$ is $O(2^n)$
 3. Consider the recurrence equation $T_n = 2T_{n-1} + 1$, where $T_0 = 0$ and $T_1 = 1$. Try to solve this recurrence in multiple ways.
 4. Try to find the closed-form solution for the Fibonacci recurrence. Verify your answer by ‘plugging’ in some values of n .
 5. In the Tower of Hanoi problem, find the shortest sequence of moves that transfers a tower of 3 disks from the left peg A to the right peg C, if the direct moves between A and C are disallowed. That is, each move must be to or from the middle peg B.
 6. Show that in the process of transferring a tower of n disks under the restrictions of the previous question, we will encounter every properly stacked configuration of n disks on 3 pegs.
 7. In the Pizza Cutting problem we know that some of regions defined by n lines in the plane are infinite while others are bounded. Find an upper bound for the bounded regions.
 8. What is the number of binary strings of length n that contain three consecutive 0's.
 9. How many binary strings of length seven contain three consecutive 0's.
 10. Write a recursive equation for finding the average number of trailing 0's in the binary expansion of all the integers from 0 to $2^n - 1$. Also solve the resulting recursive equation.
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