

CS 5300 Advanced Algorithms
HW # 4

1. Given the recurrence relation

$$T(n) = \begin{cases} 1 & \text{if } n = 1 \\ 7T\left(\frac{n}{5}\right) + 10n & \text{otherwise} \end{cases}$$

Find $T(625)$.

2. Solve the following recurrence equation

$$T(n) = \begin{cases} 0 & \text{if } n = 0 \\ 1 & \text{if } n = 1 \\ 4T(n-1) - 3T(n-2) & \text{otherwise} \end{cases}$$

3. Solve the following recurrence equation

$$T(n) = \begin{cases} 0 & \text{if } n = 0 \\ 1 & \text{if } n = 1 \\ 2 & \text{if } n = 2 \\ -6T(n-1) - 11T(n-2) - 6T(n-3) & \text{otherwise} \end{cases}$$

4. Use the binary search algorithm to search for $x = 6$, if $S = [3, 5, 7, 8, 10, 11, 17, 18, 19, 31]$. Show all the steps.
5. Use the binary search algorithm to search for $x = 19$, if $S = [3, 5, 7, 8, 10, 11, 17, 18, 19, 31]$. Show all the steps.
6. Use the sequential search algorithm to search for $x = 6$, if $S = [3, 5, 7, 8, 10, 11, 17, 18, 19, 31]$. Show all the steps.
7. Use the sequential search algorithm to search for $x = 19$, if $S = [3, 5, 7, 8, 10, 11, 17, 18, 19, 31]$. Show all the steps.
8. How can we modify almost any algorithm to have a good best-case running time?
9. Use the recursive version of the Fibonacci number to calculate $\text{Fib}(6)$
10. What are the minimum and maximum numbers of elements in a heap of height h ?
11. Illustrate the operation of BUILD-MAX-HEAP on the array $A = \langle 5, 3, 17, 10, 84, 19, 6, 22, 9 \rangle$