Solving Recurrences

Prepared by Dr. Sifat Momen

Recurrences	Examples	Solution
$T(n) = \begin{cases} \Theta(1), & n=1 \\ 2T(\frac{n}{2}) + \Theta(n), & n>1 \end{cases}$	Merge Sort, Randomized quicksort, naive quicksort (best case), counting inversions	$\Theta(n \lg n)$
$T(n) = \begin{cases} \Theta(1), & n=1 \\ T(\frac{n}{2}) + \Theta(1), & n>1 \end{cases}$	Binary Search	$\Theta(\lg n)$
$T(n) = \begin{cases} \Theta(1), & n=0 \\ T(n-1) + \Theta(1), & n>0 \end{cases}$	Factorial	$\Theta(n)$
$T(n) = \begin{cases} \Theta(1), & n=1 \\ T(n-1) + \Theta(n), & n>1 \end{cases}$	Naive Quicksort (Worst case)	$\Theta(n^2)$
$T(n) = \begin{cases} \Theta(1), & n=1 \\ 2T(n-1) + \Theta(1), & n>1 \end{cases}$	Tower of Hanoi	$\Theta(2^n)$