Assignment #4

1. Use the Rabin-Karp string matching algorithm on text $T = abbeabacbab$ searching for the pattern $P = abac$ using modulo (a) $q = 7$. (b) $q = 89$. For computing the signature, let $a = 0$, $b = 1$, $c = 2$.

2. Solve the following recurrence relations using (a) substitution; (b) master table.

$$T(n) = \begin{cases} T(1) & n \leq 2 \\ 7T(n/4) + 18n^2 & n > 2. \end{cases}$$

3. Solve the recurrence relation using substitution: $T(n) = T(n - 1) + \log n$. Assume that $T(1) = C$ for $n = 1$.

4. Suppose we modified the binary search algorithm so that instead of splitting the array from the middle it splits it $\frac{1}{3} : \frac{2}{3}$. (a) Write the equation for computing the new split point $m$. (b) Draw the binary decision tree for $n = 12$. (c) Compute the average number of comparisons for successful and unsuccessful searches. (d) For a general $n$ what is the maximum number of comparisons you need to do in order to determine if the element is/is not in the list? [Hint: the original mid point in the binary search algorithm is based on $m \leftarrow \lfloor i + \frac{1}{2}(j - i) \rfloor$]