CSCI 3333 Homework: Search

1 Recurrence Relations

Problem 1. Give a recurrence relation describing the running time of the following C++ function:

```c++
int fib(int n)
{
    if (n < 2)
        return 1;
    return fib(n-1) + fib(n-2);
}
```

Problem 2. Give a recurrence relation describing the running time of the following C++ function:

```c++
int factorial(int n)
{
    if (n < 2)
        return 1;
    return n * factorial(n-1);
}
```

2 Ternary Search

Binary search is actually just one algorithm in a family of searching algorithms called binary, ternary, quaternary, etc. search. Each k-ary search algorithm partitions the input array into k equal-sized parts, and does k – 1 comparisons to decide which of these parts the search should recurse into.

Problem 3. Describe the ternary search algorithm (can use words, pseudocode, etc. – don’t worry about precise indices, types, etc.). For convenience, call the searched-for element $x$ and the input array $A$.

Problem 4. Implement ternary search as a C++ function with header `bool search(int x, int* A, int n)`, where $x$ is the item being searched for, $A$ is the array to search in, and $n$ is the length of the array.

Problem 5. Analyze the running time of ternary search (give the recurrence relation, find a closed form, prove the closed form correct).