Assessment - Analyzing Binary Search

Consider the following Python code that is a recursive implementation of binary search:

```
def binarySearch(arr, target, lo, hi):
      '''Perform a binary search for the target value in the given list, arr.
      Use the lo and hi bounds to reference a particular range within arr.
      Return True if target is found in arr and False otherwise.'''

      if lo > hi:
            return False
      else:
            mid = lo + (hi - lo) / 2
            if arr[mid] == target:
                  return True
            elif arr[mid] < target:
                  return binarySearch(arr, target, mid+1, hi)
            else:
                  return binarySearch(arr, target, lo, mid-1)
```

1. Write down a **recurrence relation** to describe the running time of binarySearch.

2. Solve your recurrence relation from part 1 to find a **closed-form expression** of binarySearch's running time.

3. Given your closed-form solution from part 2, give a **final time complexity using Big-O notation**.