Algorithm Analysis

Assignment: 3

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(1)

D & C steps:
- Divide: check middle element with its adjacent
- Conquer: Recursively search 1 sub-array
- Combine: Trivial

Pseudo Code:

```
unimodalSearch( A, low, high)
    if (low == high)
        return high;
    mid = (low+high)/2 ;
    if ( A[mid] > A[mid-1] && A[mid]>A[mid+1] )
        return mid;
    if ( A[mid] > A[mid-1] )
        return unimodalSearch(A, mid+1, high) ;
    else
        return unimodalSearch(A, low, mid-1)
```

Analysis:
- ~~Calcu~~ calculate running time

$$T(N) = T(N/2) + O(1)$$

- Solve it using master method:

$a = 1, \; b = 2, \; f(N) = 1$

$$f(N) \longleftrightarrow N^{\log_b a}$$
$$1 \longleftrightarrow N^{\log_2 1}$$
$$1 \longleftrightarrow N^{0}$$
$$1 \longleftrightarrow 1$$

$N^{\log_b a} = \Theta(f(N))$ ~~*~~ case (2)

$$T(N) = \Theta(\log(N))$$

2) D & C steps:

- Divid: Trivial
- Conquer: Recursively solve 1 part only (with N/2)
- Combine: mul the solution of subProblem by itself (and by A if odd)

Pseudo Code:

```
Power( A, N)
    if (N==1)
        return A;
    Pow = Power( A, floor(N/2)) ;
    if ( N%2 != 0)
        return Pow * Pow * A ;
    else
        return Pow * Pow ;
```

Analysis;

- calculate running time (recurrence relation)

$$T(N) = T(N/2) + O(1)$$

- solve it using master method

$a = 1 \quad b = 2 \quad f(N) = 1$

$f(N) \longleftrightarrow N^{\log_b a}$

$1 \longleftrightarrow N^{\log_2 1}$

$1 \longleftrightarrow N^{0}$

$1 \longleftrightarrow 1$

$N^{\log_b a} = \theta(f(N))$ # case (2)

$$T(N) = \theta(\log(N))$$