Name:_____

NetID:_____   **Lecture:**   **B**

Discussion: **Friday**   **11   12   1   2   3   4**

```
1  Jump(A,bottom,top)   \\ A is an array of integers, bottom and top are positive integers
2        if (top = bottom+1) return bottom
3        middle = floor(bottom+top/2)
4        if (A[middle] = 0)
5                return Jump(A, bottom, middle)
6        else
7                return Jump(A, middle, top)
```

3 $\text{middle} = \text{floor}(\frac{\text{bottom}+\text{top}}{2})$

1. (3 points) Suppose that A is an array of length n ($n \geq 2$) containing a sequence of positive integers followed by zeros, where $A[1] > 0$ and $A[n] = 0$. What does Jump(A,1,n) return?

2. (5 points) Let $T(n)$ be the running time of Jump. Give a recursive definition of $T(n)$.

3. (3 points) What is amount of work (aka sum of the values in the nodes) at level k in the recursion tree for $T(n)$?

4. (4 points) What is the big-Theta running time of Jump?

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```
01  Skip(k,n)   \\ inputs are natural numbers
02          if (n = 0) return 1
03          else if (n = 1) return k
04          else if (n is odd)
05                  temp = Skip(k,floor(n/2))
06                  return k*temp*temp
07          else
08                  temp = Skip(k,floor(n/2))
09                  return temp*temp
```

1. (5 points) Suppose $T(n)$ is the running time of Skip. Give a recursive definition of $T(n)$, assuming that n is a power of 2.

2. (4 points) What is the height of the recursion tree for $T(n)$?

3. (3 points) How many leaves are in the recursion tree for $T(n)$?

4. (3 points) What is the big-Theta running time of Skip?