CIS507: Design & Analysis of Algorithms
Quiz 2, Spring 2012

Duration: 20 minutes
Total weight: 5%

Student Name: –

Student ID: –

Problem	Points Obtained	Points Possible
1		3
2		2
Total		5

1 True or False (3 points)

1. **(0.5 point)** A binary tree of hight 5 has 2^5 nodes in total.
2. **(0.5 point)** Counting sort is a comparison sorting algorithm.
3. **(0.5 point)** We can sort 7 numbers with 10 comparisons.
4. **(0.5 point)** Merge sort sorts elements "in place".
5. **(0.5 point)** Insertion sort sorts elements "in place".
6. **(0.5 point)** The probability that Randomized Quicksort takes $\Omega(n^2)$ to sort an array of size n is at least $1/(n^n)$.

2 Algebra and Sums (2 points)

Prove the following:

$$\sum_{k=\frac{n}{2}}^{n-1} k \leq \frac{3}{8}n^2 \quad \text{for any} \quad n \geq 1$$

You may find this useful: $\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$