Handwriting Assignment #1: Algorithm

Due to 2nd, Oct.

1. Prove by induction that $2^n < n!$ for every integer $n \geq 4$.

2. Decide whether each of the following statements is true or false, and prove that your conclusion is correct.

1) $n^2 = O(2^n)$

2) $2^{n+1} = O(2^n)$

3) $2^{2n} = O(2^n)$

3. Solve the following recurrence by the master method. Show your work.

$$T(n) = \begin{cases} \Theta(1) & n = 1 \\ T(n/2) + \Theta(1) & n > 1 \end{cases}$$

4. Solve the recurrence by recursion tree

$$T(n) = \begin{cases} 1 & n = 1 \\ T(n-1) + n & n > 1 \end{cases}$$

5. Solve the following recurrence by the master method.

$$T(n) = T(\frac{9n}{10}) + n.$$

6. Trace the insertion sort as it sorts the following array into ascending order: 25 30 20 80 40 60

7. Trace the *mergesort* algorithm as it sorts the following array into ascending order. List the calls to *mergesort* and *merge* in the order in which they occur.

20 80 40 25 60 30