CMPS 201
Spring 2010
Homework Assignment 5

1. (3 Points) (This is problem 7-3 on p.161 of the 2nd ed., and problem 8-3 on p.169 of the 1st ed.)
    Professors Howard, Fine, and Howard have proposed the following "elegant" sorting algorithm:

    Stooge-Sort(A, i, j)
    1. if $A[i] > A[j]$
    2. $A[i] \leftrightarrow A[j]$
    3. if $i + 1 \geq j$
    4.   return
    5. $k \leftarrow \lfloor (j - i + 1)/3 \rfloor$
    6. Stooge-Sort($A, i, j - k$)
    7. Stooge-Sort($A, i + k, j$)
    8. Stooge-Sort($A, i, j - k$)

    a. (1 Point) Argue that, if $n = \text{length}[A]$, then Stooge-Sort($A, 1, n$) correctly sorts the input array
        $A[1 \cdots n]$. (Hint: use induction on length$[A[i \cdots j]] = j - i + 1$.)
    b. (1 Point) Give a recurrence for the worst-case running time of Stooge-Sort and a tight
        asymptotic (Θ-notation) bound on the worst-case running time.
    c. (1 Point) Compare the worst-case running time of Stooge-Sort to that of insertion sort, merge
        sort, heapsort, and quicksort. Do the professors deserve tenure?