Homework Set #3

1. (10 points) Exercise 4.3-4 (page 75)

2. (40 points) Exercise 4-1 (page 85)

3. (30 points) Pseudo-code Analysis: For the pseudocode below for Mystery, find a tight upper bound on its worst-case asymptotic running time \( T(n) \), where \( n \) is the length of the portion of array \( A \) that is processed by Mystery. That is, find \( g(n) \) such that \( T(n) \in O(g(n)) \), where \( n = \text{right} - \text{left} + 1 \). You may assume that \( n \) is a power of 2. Justify your answer.

\[
\text{Mystery}(A,k,\text{left},\text{right})
\]

\[
\begin{align*}
\text{if } \text{left} &= (\text{right}-1) \\
\text{then if } A[\text{left}] &= k \\
\text{then print "Match for" } k & \text{ "found at position" } \text{left} \ "." \\
& \text{return } k \\
\text{if } A[\text{right}] &= k \\
\text{then print "Match for" } k & \text{ "found at position" } \text{right} \ "." \\
& \text{return } k \\
& \text{return } -1
\end{align*}
\]

\[
s \leftarrow \left \lfloor \sqrt{\text{right} - \text{left} + 1} \right \rfloor
\]

\[
sDouble \leftarrow \sqrt{\text{right} - \text{left} + 1}
\]

\[
s \leftarrow \left \lfloor sDouble \right \rfloor
\]

\[
\text{for } i \leftarrow 1 \text{ to } s
\]

\[
\text{do } \text{leftI} \leftarrow \text{left} + (i-1) \times s \\
\text{rightI} \leftarrow \text{leftI} + s - 1 \\
\text{result} \leftarrow \text{Mystery}(A,k,\text{leftI},\text{rightI}) \\
\text{if } \text{result} \neq -1 \\
\text{then return } \text{result}
\]

\[
\text{return } -1
\]