CSC236 tutorial exercises, Week #8

Here are your tutorial sections:

Surname	Time	Room	TA
A–K	Friday 11	SS1088	Zhaowei
L–Tg	Friday 11	SS2105	Hamed
Th–Z	Friday 11	BA2175	Gal
A–L	Friday noon	AB114	Wen
M–Z	Friday noon	BF323	Lauren
A–K	Friday 1	BA1170	Ammar
L–Tg	Friday 1	AB107	Alex
Th–Z	Friday 1	AB114	Shems
A–K	Thursday 8	BA2139	Zach
L–Tg	Thursday 8	BA2185	Ekansh
Th–Z	Thursday 8	BA2195	Danniel

These exercises are meant to give you practice applying the Master Theorem to divide-and-conquer algorithms.

1. A non-empty array A with integer entries has the property that no odd number occurs at a lower index than an even number. Devise a divide-and-conquer algorithm for finding the highest index of an even number element, or -1 if A has no elements that are even numbers. Use the Master Theorem to bound the asymptotic time complexity of your algorithm.

2. Consider this informal algorithm for QuickSort of a non-empty array A of distinct integers

   (a) Choose a pivot, p from A in constant time

   (b) Partition A into A_{p^-} consisting of elements less than p, $[p]$ itself, and A_{p^+} consisting of elements greater than p. Recursively QuickSort A_{p^-} and A_{p^+}

   (c) Concatenate the sorted version of A_{p^-}, $[p]$, and the sorted version of A_{p^+}

   Write a recurrence T, for the time complexity of QuickSorting A. Assume the worst (that the constant-time choice of a pivot is consistently unlucky), and use repeated substitution to find a closed form for T. Assume the best (that the constant-time choice of a pivot is consistently lucky) and use the Master Theorem to bound T.