Range search and tries

You are given a trie $T$ of $n$ words and size of the alphabet $|\Sigma| = k$. You may assume at each node of the trie is an array of size $k$ storing a pointer to each child node.

1. Given words $w_1$ and $w_2$ describe how you would find all words in between (lexicographically) $w_1$ and $w_2$.

2. How would you find longest word between $w_1$ and $w_2$?

3. Now modify the trie, to make search for the longest word between $w_1$ and $w_2$ faster. Analyse your solution for running time.

Building a kd-tree

Describe how to build a kd-tree of $n$ points in worst case $O(n \log n)$ time without using *QuickSelect*.
Quadtree search

Given below is a quadtree $T$, with the area corresponding to it $R = [0, 8) \times [0, 8)$. Give a query rectangle $A$, such that quadtree search will visit every node, but return nothing.