Problem 1

Let $A$ be an array of $n$ unsorted integers. A 5-increasing sequence is a sequence of 5 consecutive entries in $A$ that are in increasing order. Show that to find a 5-increasing sequence in $A$, we need at least $\frac{n}{8}$ comparisons in the worst case.

Problem 2

For this question we are going to be looking at Boyer Moore (without good suffix heuristic).

a) Given text $T = \text{"aaaaaaaaa"}$ give a pattern $P$ such that $P \notin T$ and using Boyer Moore it takes $mn$ comparisons to conclude that $P \notin T$.

b) Compute the last occurrence array $L$ for $P = \text{"cba"}$. How many comparisons does Boyer Moore do if we search for $P$ in $T = \text{"abababababab"}$?

Problem 3

For the following strings and texts perform Boyer Moore with good suffix heuristic using a table as done in class:

a) $T = \text{"lmnnpaapa"}$, $P = \text{"npaapa"}$

b) $T = \text{"npalmnnpaapa"}$, $P = \text{"npnnaapa"}$

c) $T = \text{"abcdefaa..."}$, $P = \text{"naapaapaa "}$

d) $T = \text{"abcdefxxa..."}$, $P = \text{"naapaapaa "}$

e) $T = \text{"leveeeve, $P = \text{"eevee"}$}

f) $T = \text{"chuachupikapika", $P = \text{"pikachu"}$

Problem 4

Compute the KMP failure array for $P = \text{"ababaca"}$. 
Problem 5

Let $w_1, \ldots, w_k$ be a set of words, where $n = |w_1| + \ldots + |w_k|$. Find, in $O(n)$ time, the longest word $w$ such that $w$ is the prefix of at least two words in $w_1 \ldots w_k$. 