HOMEWORK ASSIGNMENTS 2 CSC 311

EXERCISE 1

Consider this brute-force string matching algorithm:

```
input : T[0..n-1], a text
        P[0..m-1], a pattern
output: position of first occurrence of P in T, or -1

for i ← 0 to n-m
    j ← 0
    while j < m and P[j] = T [i+j]
        increment j
    if j = m
       return i
return -1
```

a. Construct a P and a T that cause the worst-case behavior of this algorithm.
b. How many comparisons does your worst case require?

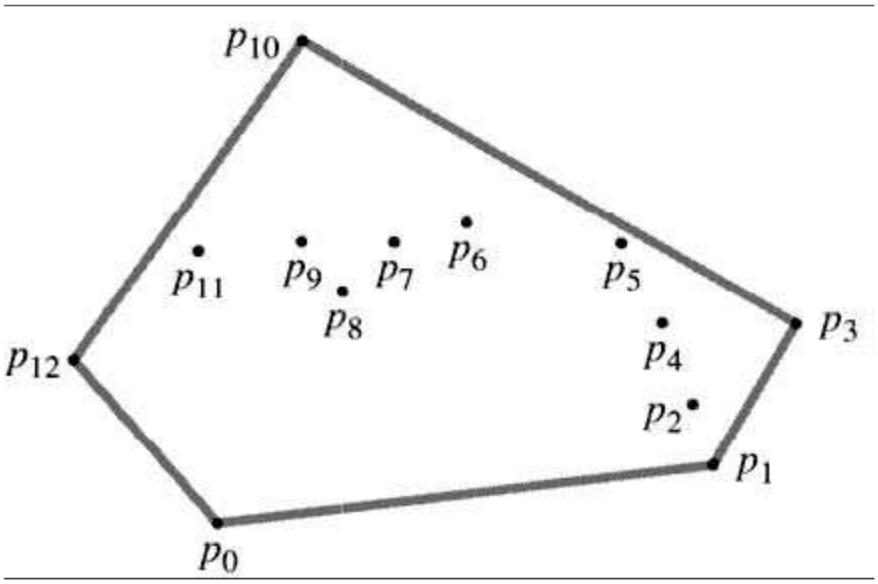
EXERCISE 2

Let x1 < x2 < ... < xn be real numbers representing coordinates of n villages located along a straight road. A post office needs to be built in one of these villages.

a. Find the post-office location minimizing the average distance between the villages and the post office using the following examples:
   - x1=2, x2=5, x3=6, x4=7, x5=8
   - x1=2, x2=5, x3=6, x4=8
b. Design an algorithm to find the post-office location minimizing the average distance between the villages and the post office.

EXERCISE 3

Given a set of n points pi $\in$ P in the plane, the convex hull C of P is the smallest convex polygon containing P. The convex hull can be specified as the clockwise cycle of vertices of the polygon. The figure below shows an example of the convex hull of 13 points.



a. Design an algorithm that determines the two extreme points of the convex hull of a given set of n points in the plane.

EXERCISE 4

Consider the following small instance of the linear programming problem:

$$\begin{aligned} \text{maximize} \quad & 3x + 5y \\ \text{subject to} \quad & x + y \leq 4 \\ & x + 3y \leq 6 \\ & x \geq 0, \;\; y \geq 0 \end{aligned}$$

a. Sketch, in the Cartesian plane, the problem's feasible region defined as the set of points satisfying all the problem's constraints.

b. Identify the region's extreme points.

c. Solve the optimization problem given by using the following theorem: A linear programming problem with a nonempty bounded feasible region always has a solution, which can be found at one of the extreme points of its feasible region.