# Homework Exercises for Lecture 1

A.1-1   (i) Compute the VC-dimension of the space dual to $(\mathbb{R}^2, L)$ where $L$ is the set of all
          the lines.

   (ii) Compute the VC-dimension of $(\mathbb{R}^2, S)$ where $S$ is the set of all the line segments.

   (iii) Compute the VC-dimension of the set system dual to the one defined in (ii).

A.1-2 Consider a set $R$ of $n$ disjoint regions in $\mathbb{R}^2$ with simply connected boundaries (in other
      words, each $r \in R$ is the set of all the points contained inside a closed curve). Let $C$ be
      a set of curves in $\mathbb{R}^2$. We say two curves $c_1, c_2 \in C$ are *equivalent* if the set of regions
      crossed by them is identical.

   (i) What is the maximum size of $C$ if we know no two curves in $C$ are equivalent?

   (ii) Show that if we add an additional assumption to (i) that the curves are disjoint
        then $|C| = O(n^4)$.