Homework 3
36-705
Due: Thursday Sept 25 by 3:00

1. Let $\mathcal{C} = \mathcal{A} \bigcup \mathcal{B}$. Show that
$$s_n(\mathcal{C}) \leq s_n(\mathcal{A}) + s_n(\mathcal{B}).$$

2. Let $\mathcal{C} = \{A \cup B;\ A \in \mathcal{A},\ B \in \mathcal{B}\}$. Show that
$$s_n(\mathcal{C}) \leq s_n(\mathcal{A}) s_n(\mathcal{B}).$$

3. Show that $s_{n+m}(\mathcal{A}) \leq s_n(\mathcal{A}) s_m(\mathcal{A})$.

4. Let
$$\mathcal{A} = \left\{ A = [a,b] \cup [c,d] :\ a \leq b \leq c \leq d \right\}.$$
Find VC dimension of $\mathcal{A}$.

5. A set $A \subset \mathbb{R}^d$ is star-shaped if $x \in A$ implies that $\alpha x \in A$ for all $0 \leq \alpha \leq 1$. Let A be star-shaped. Let $\mathcal{A} = \{rA :\ r > 0\}$ where $rA = \{ry :\ y \in A\}$. Find the VC dimension of $\mathcal{A}$.

6. Chapter 5, problem 2.

7. Chapter 5, problem 5.

8. Chapter 5, problem 7.

9. Chapter 5, problem 12.

10. Chapter 5, problem 15.