MATH 4760/8766
Homework Assignment # 15: Fractal Dimension

Problem 1: Let (X, d) be a metric space and A be a finite subset of X. What is $D(A)$? Prove your answer directly from Definition 11.1.

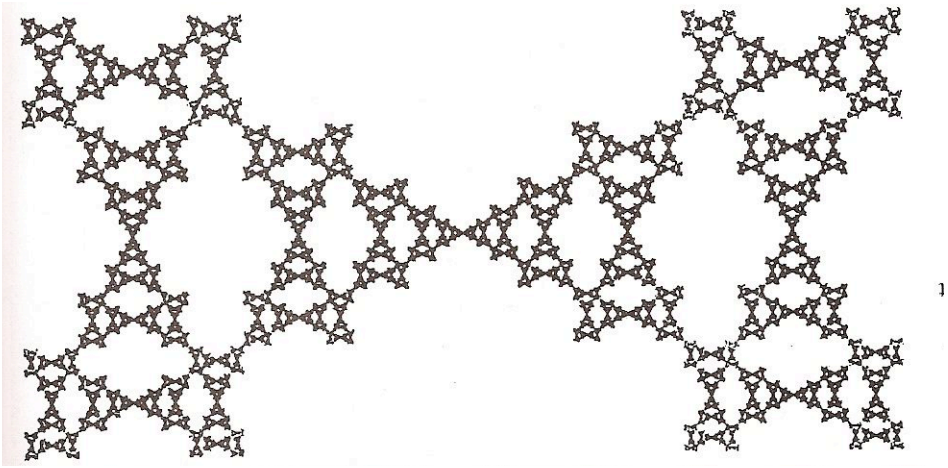
Problem 2: Let $\mathbf{S} \subseteq \mathbb{C}$ be a Sierpiński triangle with vertices at $0, 1, i$ (see Example 9.3). What is $D(\mathbf{S})$? Justify your answer using Box Counting Theorem 11.4.

Problem 3: Find a just touching IFS of similitudes in $\mathbb{R}^2$ whose attractor is

$$S = \{(x_1, x_2) \in \mathbb{R}^2 : 0 \leq x_1 \leq 1 \ \& \ 0 \leq x_2 \leq 1\}$$

Use Theorem 11.5 to determine $D(S)$.

Problem 4: The attractor of a just touching hyperbolic IFS $\{\mathbb{R}^2; w_1, w_2, w_3\}$is represented in the figure below. The affine transformations $w_i : \mathbb{R}^2 \longrightarrow \mathbb{R}^2$ are similitudes. Use the Collage Theorem to find the similitudes and then use Theorem 11.5 to calculate the fractal dimension of the attractor.



Problem 5: The figure below represents the attractor A of a certain hyperbolic IFS. Find $D(A)$.