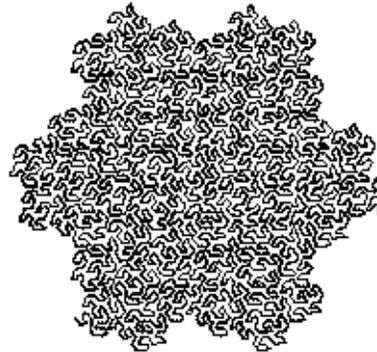
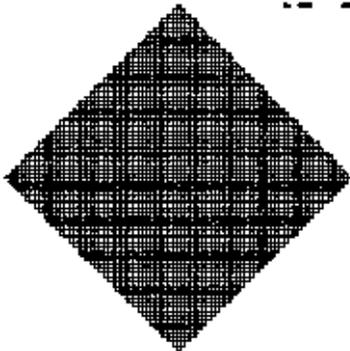
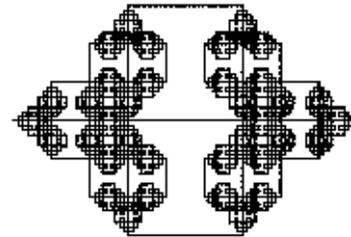
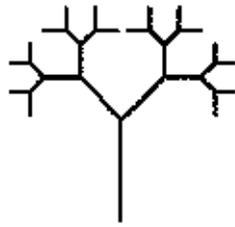


Name \_\_\_\_\_

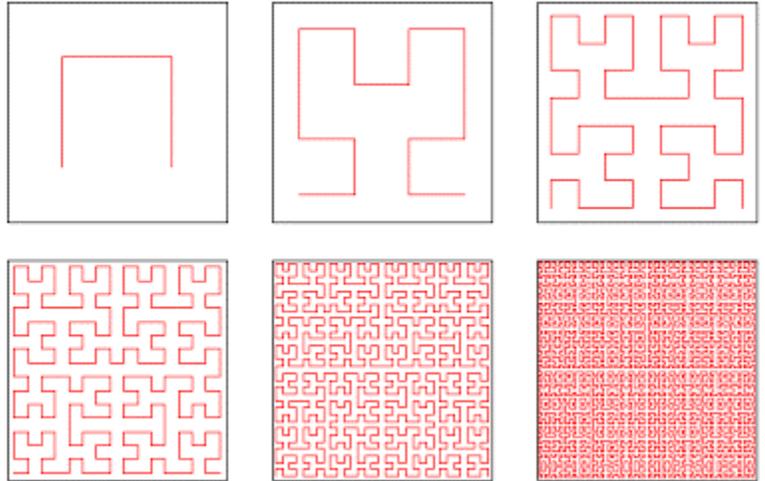
## Introduction to Fractals: Geometry and Self-Similarity Dimension

Fractals are geometrical shapes, but they do not look like standard geometrical shapes that you would see in a high school classroom, shapes such as squares, circles, triangles and trapezoids. Here are some images of fractals:



We will be focusing on three specific fractals as part of our introduction to this sort of shape. Take notes on this page as we discuss in class, especially note issues of *dimension*. Be sure to label the **INITIATOR** and the **GENERATOR** for each fractal.

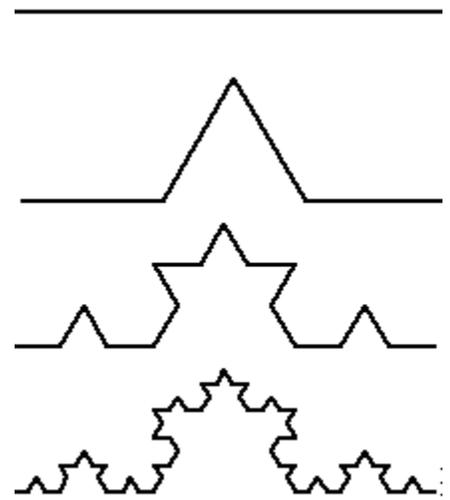
### 1) THE HILBERT CURVE



### 2) THE CANTOR SET



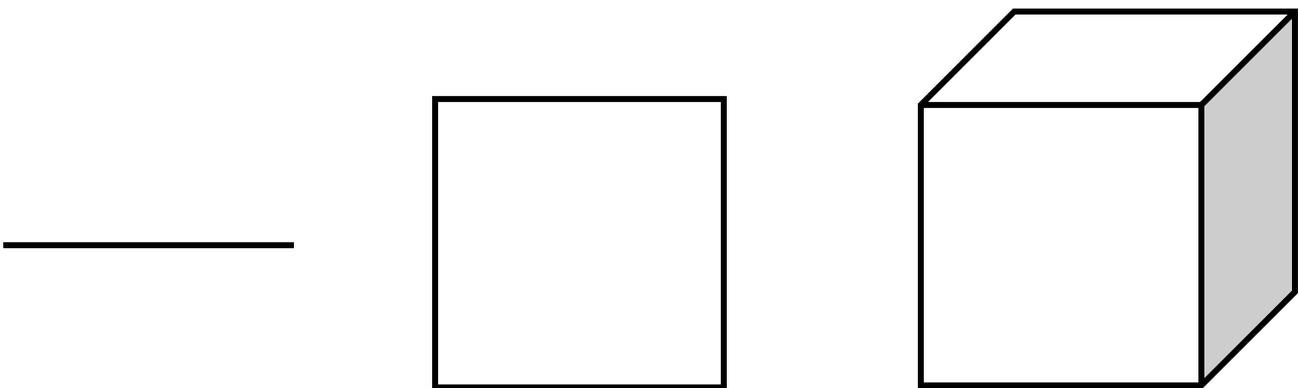
### 3) THE KOCH CURVE



We are seeing that fractals have properties that are different from “standard” geometrical shapes. We also see that fractals can look very different from each other, but there are FIVE PROPERTIES that all fractals have. These are the properties that define a fractal:

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_
- 4) \_\_\_\_\_
- 5) \_\_\_\_\_

As we began our geometry unit we looked at two different definitions of dimension (“Location” and “Degrees of Freedom”). There are many definitions of dimensions in mathematics, and neither of those two work well in describing fractals. We need another definition of dimension, and it will be that of **SELF-SIMILARITY (SSD)**.



**THE SELF-SIMILARITY DIMENSION FORMULA IS:**

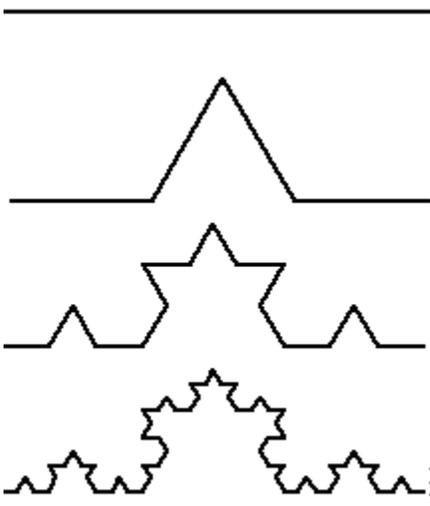
Consider the **CANTOR SET** with regard to dimension – remembering that it begins as a line segment, which is one-dimensional, but results in a dusting of infinitely many points, which are all zero-dimensional. Apply what we have seen so far of **SELF-SIMILARITY DIMENSION (SSD)** to the first two stages of this shape – that is apply the idea to Stage 0 (Initiator) and Stage 1 (Generator).



The space below has been left for notes on our discussion of exponents and their inverses.

Use the formula above (and your calculator) to find the SSD of each of the following fractals. In each case, consider only Stage 0 (INITIATOR) and Stage 1 (GENERATOR).

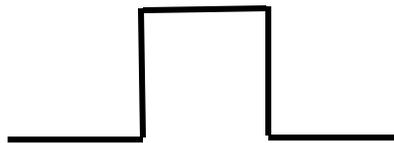
1) **THE KOCH CURVE:**



2) THE SQUARE KOCH CURVE:



Stage 0 (INITIATOR)



Stage 1 (Generator)