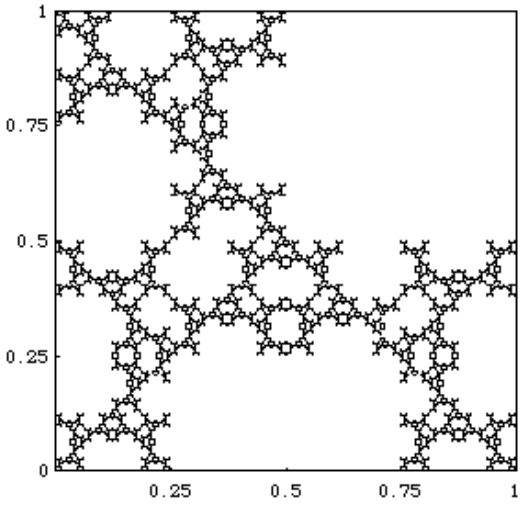
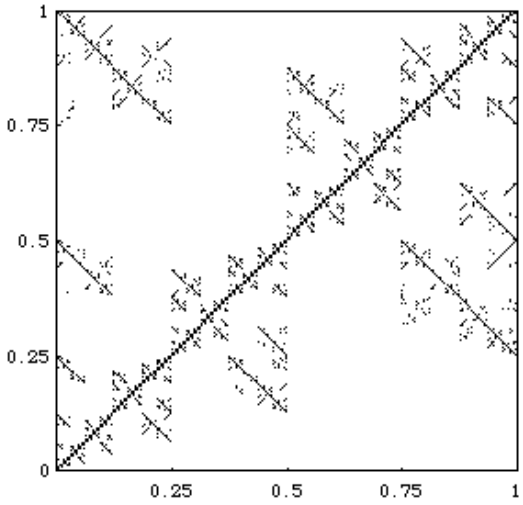
Practice Exam 2

1. Find IFS rules to generate each of these fractals.

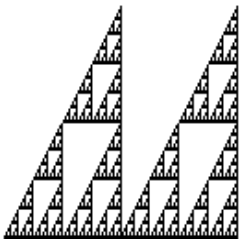




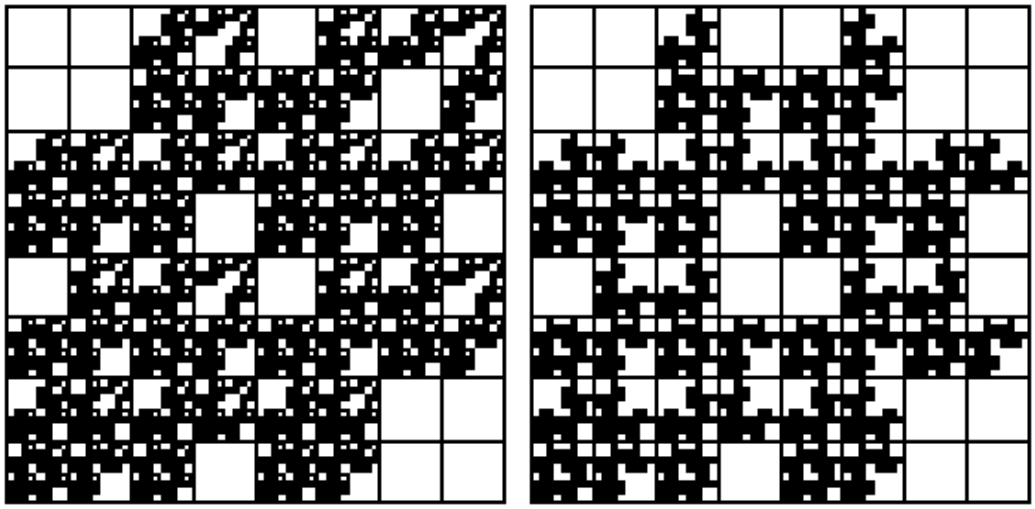
2. (a) Compute the dimensions of the fractals in problem 1. If you must use the Moran equation, setting up but not solving the equation suffices.

(b) Denote by $N_r(A)$ the number of boxes of side length r needed to cover a fractal A, and by $N_r(B)$ the number of boxes of side length r needed to cover a fractal B. Suppose for each size r, $N_r(A) = N_r(B)^2$. How are the box-counting dimensions of A and B related? Give a reason to support your answer. Hint: recall the definition of box-counting dimension, and the properties of logarithms.

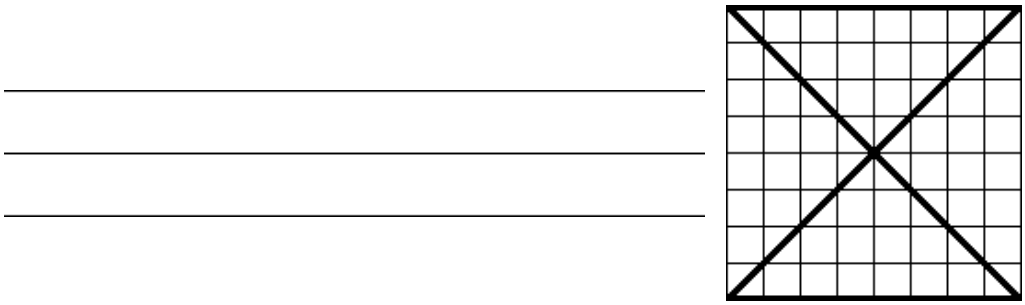
(c) What is the dimension of this shape? Hint: recall the algebra of dimensions results.



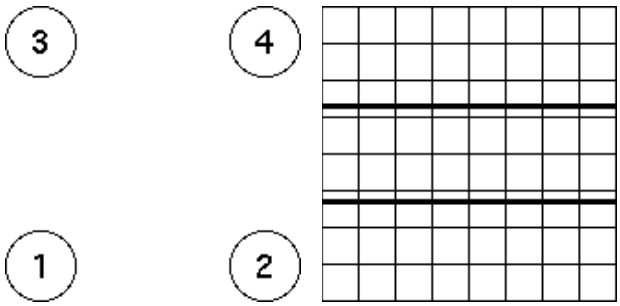
3. One of these driven IFS is generated by 1-step memory (forbidden pairs), the other by 2-step memory (forbidden triples). Say which is which, and give a detailed reason supporting your answer.



4. (a) Using the bin boundaries below, sketch a time series whose driven IFS will be two horizontal lines, one at the top of the driven IFS square, the other at the bottom, and two diagonal lines. Explain how your data generates this picture.

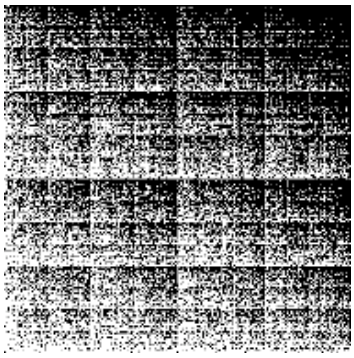


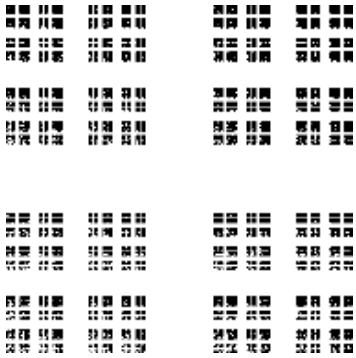
(b) Assuming the picture on the right can be by an IFS with 1-step memory, fill in the appropriate arrows on the left.

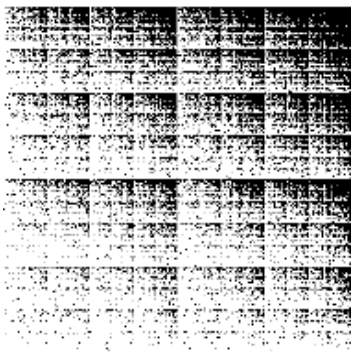


5. (a) Suppose $r_1 = ... = r_N = r$, and $p_1 = ... = p_N = 1/N$. Show $\alpha = \text{Log}(N)/\text{Log}(1/r)$.

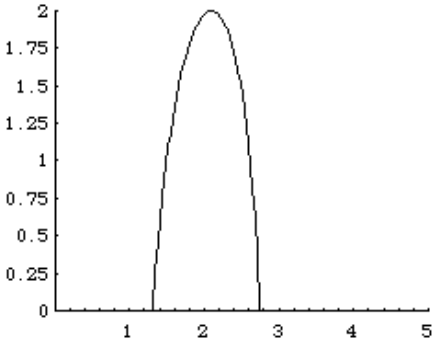
(b) Match these IFS pictures with the corresponding $f(\alpha)$ graphs. Explain all your choices. “Elimination” is not an explanation.

A 

B 

C 

D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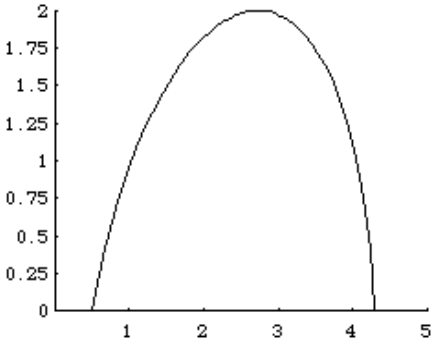
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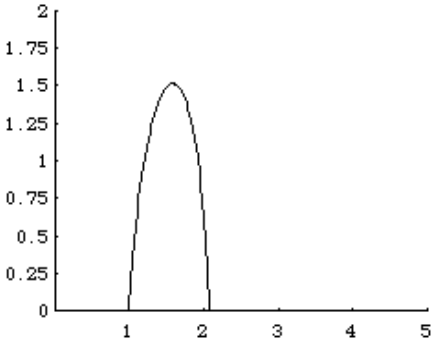
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