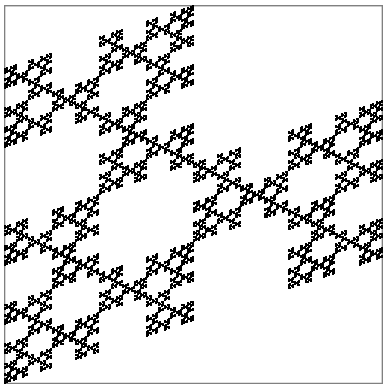
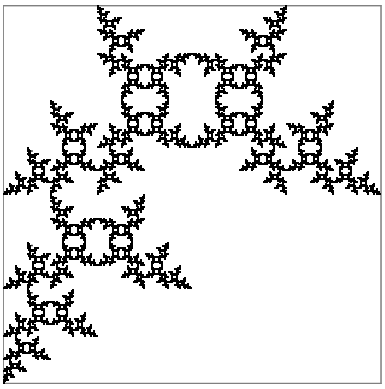
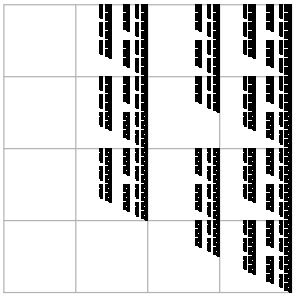
Math 190 Midterm Exam

1. Find the IFS rules to generate these fractals. For reference, the unit square is drawn in grey around each fractal. You may not need all the rows in each table.

(a) 

(b) 

2. Pictured here is an IFS with memory generated by forbidden pairs.



(a) Draw the transition graph.

(b) Based on properties of this transition graph, show this fractal can be generated by an IFS without memory, with a finite number of transitions. Give explicit details. You know which words you must use.

(c) Give the table for the IFS of part (b).

3. Recall the Cantor middle-halves set C consists of $N = 2$ pieces, each scaled by $r = 1/4$. Which of these have dimension less than 2? Which have dimension greater than 2? Support your answers.

(a) $C \times C$

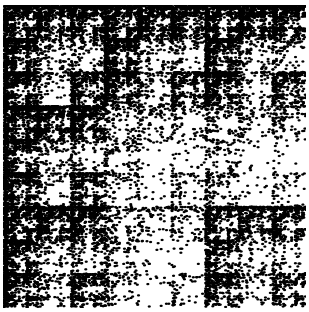
(b) $C \times C \times C$

(c) $C \times C \times C \times C$

(d) $C \times C \times C \times C \times C$

(e) $C \times C \times C \times C \times C \times C$

4. For the driven IFS pictured here

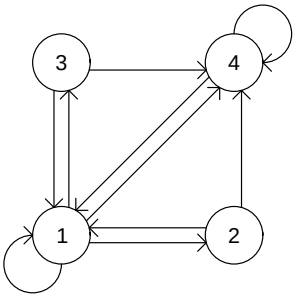


a) Find the exact value of $f(\min\alpha)$ and of $f(\max\alpha)$. Explan how you arrived at your answers.

(b) Find the exact value of the maximum height of the $f(\alpha)$ curve. Explain how you arrived at your answer.

4. (c) Sketch the graph of the $f(\alpha)$ curve. Note that you cannot compute $\min\alpha$ and $\max\alpha$ because from the IFS you can't get the values of the probabilities.

5. (a) Compute the dimension of the fractal produced by this transition graph. Hint: the part of the fractal corresponding to a rome is a copy of the fractal scaled by $r = 1/2$.



(b) Compute the dimension of the fractal produced by this transition graph.