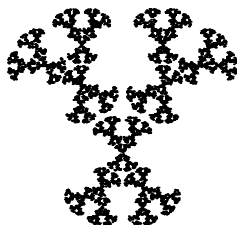


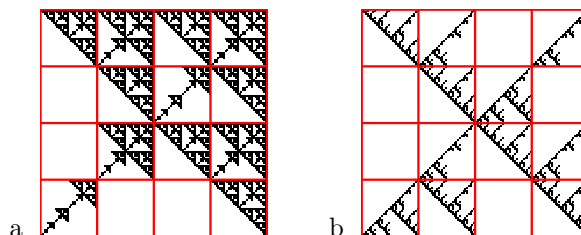
Second homework set solutions

1.

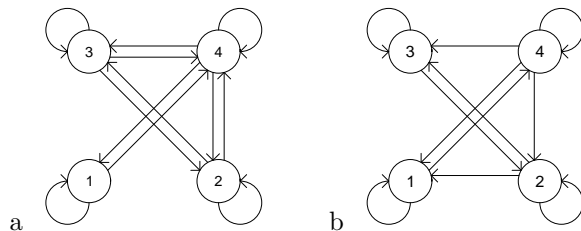
$r$	$s$	$\theta$	$\varphi$	$e$	$f$
0.5	0.5	-30	-30	1	1
0.5	0.5	30	30	-1	1
0.5	-0.5	0	0	0	-1



2. Inspecting the IFS with memory images, with length 2 address squares superimposed, we see the forbidden length 2 addresses are (a) 12, 21, 13, and 31, and (b) 21, 13, 31, 42, and 43.

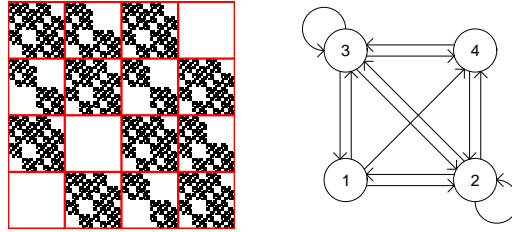


Here are the transition graphs, made with every arrow that does not correspond to a forbidden transition. For (a) the allowed arrows are  $1 \rightarrow 1$ ,  $1 \rightarrow 4$ ,  $2 \rightarrow 2$ ,  $2 \rightarrow 3$ ,  $2 \rightarrow 4$ ,  $3 \rightarrow 2$ ,  $3 \rightarrow 3$ ,  $3 \rightarrow 4$ ,  $4 \rightarrow 1$ ,  $4 \rightarrow 2$ ,  $4 \rightarrow 3$ , and  $4 \rightarrow 4$ . For (b) the allowed arrows are  $1 \rightarrow 1$ ,  $1 \rightarrow 4$ ,  $2 \rightarrow 1$ ,  $2 \rightarrow 2$ ,  $2 \rightarrow 3$ ,  $3 \rightarrow 2$ ,  $3 \rightarrow 3$ ,  $4 \rightarrow 1$ ,  $4 \rightarrow 2$ ,  $4 \rightarrow 3$ , and  $4 \rightarrow 4$ .



3. The empty length 2 addresses are 11, 14, and 44, so the allowed arrows are  $1 \rightarrow 2$ ,  $1 \rightarrow 3$ ,  $1 \rightarrow 4$ ,  $2 \rightarrow 1$ ,  $2 \rightarrow 2$ ,  $2 \rightarrow 3$ ,  $2 \rightarrow 4$ ,  $3 \rightarrow 1$ ,  $3 \rightarrow 2$ ,  $3 \rightarrow 3$ ,  $3 \rightarrow 4$ ,

$4 \rightarrow 2$ , and  $4 \rightarrow 3$ . Consequently, states 2 and 3 are romes. For each non-rome there is a path from a rome to the non-rome: the non-romes are 1 and 4, and we have  $2 \rightarrow 1$ ,  $2 \rightarrow 4$ , and  $3 \rightarrow 1$ ,  $3 \rightarrow 4$ . The only path between non-romes is  $1 \rightarrow 4$ .



$r$	$s$	$\theta$	$\varphi$	$e$	$f$
0.5	0.5	0	0	0.5	0
0.5	0.5	0	0	0	0.5
0.25	0.25	0	0	0.25	0
0.25	0.25	0	0	0	0.25
0.25	0.25	0	0	0.75	0.5
0.25	0.25	0	0	0.5	0.75
0.125	0.125	0	0	0.625	0.5
0.125	0.125	0	0	0.5	0.625