Linnaeus University
Mathematics
Hans Frisk

Test of the 4 programs in the project

1. Solve
$$a_{n+1} = 3a_n + 2^n, \quad a_1 = 1.$$

   by using the program `rec_rel_lin`.nb. Try also to solve also the system

   $$a_{n+1} = 3a_n + b_n, \quad b_{n+1} = -a_n + 2b_n$$

   when $a_0 = b_0 = 1$. Then you have to modify the program somewhat. You can read about RSolve by selecting it with mouse and choose Find Selected Function in the help menu (or simply press F1).

2. Run, using the second program `rec_rel_nonlin`.nb, the orbit that starts at $x_0 = 0.05$ with the pararmeter $a = 2.5$. Do 30 iterations. Look also at the bifurcation diagram in the region $3.5 \leq a \leq 3.6$. How many period doublings can you see?

3. Run rule 102 on the one dimensional cellular automata program `ca_1D`.nb. Iterate 15 times. Start with 40 cells, cell 20 is black the rest is white. Then run it with the seed of 20 black cells from cell 11 to 30. Use $seed[[11;;30]] = 1$ to construct the seed. For the ArrayPlot you can add the command Mesh→True so you get a grid.

4. Run rule 746 on the two dimensional cellular automata program `ca_2D`.nb. Iterate 200 times. Start with 7 black cells in a row. Run the movie! For the ArrayPlot you can add the command Mesh→True so you get a grid.