Mathematica Problems on Recurrence Relations (RR) and Cellular Automata (CA)

1. You take a loan of S dollars that is to be paid back in T periods of time. If r is the interest rate per period of the loan, what constant payment P do you have to make at the end of each period. This is a boundary value problem. What are the boundary values? Solve it on the computer. Say $r = 0.06$ and $S = 15000$. Try different P and see for which T you have paid back. Plot with command Plot how the debt changes with time. Find a formula for $P(r, s, T)$. **OP**

2. Check if you, like in the logistic map, can find a stable 2-cycle for the map $g(x) = x\ e^{a(1-x)}$. The command for exponential function is Exp. Starting value is now any positive real number but you can take something close to 1. Interesting a values are between one and five. You have to change function in the program. Solve will protest somewhat when you run but you can trust the output. (You can take away the Solve-part). You also have to change the plot ranges.

3. Start with one black cell ■. Create a triangle with alternating black and white cells. So next row is ■□■ and then ■□■□■ and so on. You have to explain how you get the rule number.

4. Run the outer totalistic rule 90016 starting with a wall, that is a square with white cells in the interior and black cells at the boundary. Take for example a 50 times 50 square. Do 1,2,3,4, 100, 3000 and 3001 iterations. What happens? Express 90016 in base 2 and describe in words the rule, when will birth, death and survival happen? Where starts the life? Why no life outside the wall?