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

1. Find a RR for the number of ways, a_n, to climb n stairs if the allowed steps are 1,2 or 3 staircases. What are the initial conditions for this RR? Solve the problem with RSolve. If you don't like the output use N for numerical value and Re for real part. In how many ways can one climb 50 stairs? Plot with command Plot the first 20 values of a_n.

2. Plot the value of the derivative of $g(x) = ax(1-x)$ at the two fix points for $0 < a < 4$. Try to formulate a criteria for the stability of a fix point.

3. Run the following 1D CA: A cell is black in next generation if and only if either of it neighbours, but not both, was black on the step before. What is the rule number? Do 500 iterations using one black cell as seed. Your string can be 1000 cells long. **OP**.

4. Run the seed Die Hard for rule 224 (Game of Life). Do at least 130 iterations. See for example the Wikipedia article about Game of Life. There you find the seed. What happens? Plot the start configuration and some nice looking iteration. Take a sufficiently large grid so you don't hit the boundary.