CS3414. Homework problem set VII. The problem is worth 30 points.

4. Differential equations are not the only mathematical tool that can be used to describe time-evolution of a system. Another popular method is that of "discrete maps", in which the state of the system at time t_n is some function (mapping) of its state at time t_{n-1}. One of the most famous maps of that kind is the so-called `Game of Life`, see `www.math.com/students/wonders/life/life.html` or `https://bitstorm.org/gameoflife/` . A very simple set of rules describes how an initial configuration of points on a square lattice evolves in time, step by step, creating whimsical patterns. Some people claim that the `Game of Life` can be used as a model of life on Earth! Well, people always claim things, don't they?

Explore the game and any of the sites that let you run it, and try to produce a few "evolution sequences" of your own. In particular, can you create your own oscillating sequence not shown on the two sites above? Feel free to use their java applets or whatever. Here is a more scientific question for you: can the number of "live" cells, x, be described, albeit very approximately, by the simple population growth equation $x' = ax$ $(a \neq 0)$? How about the logistic equation $x' = a(x - x^2)$? ENJOY!