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CSCI 4446: PS1, Problem 4

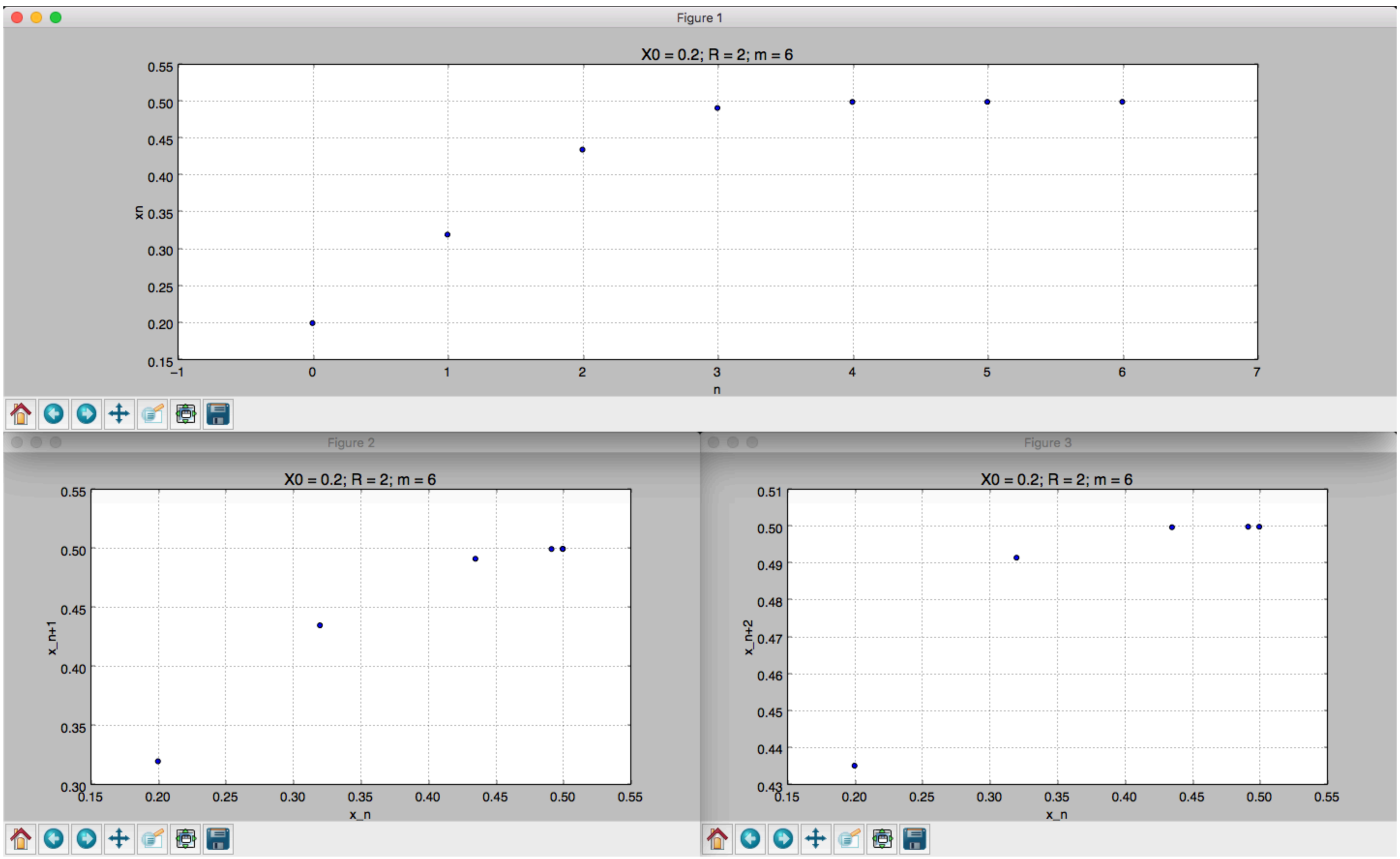
Playing with R seemed to modify both the type of attractor (fixed point versus periodic orbit) of our logistic map system, as well as the value of that attractor. An R value of 2 places a fixed point attractor at 0.5 for any starting conditions, but and R value of 3.3 gives a limit cycle centered around .66, for example.

When R > 4, we see very unstable behavior. At larger n values, the plot quickly blows up. One state has a value of 15 and the next has a value of 10^7. There is no finite attractor here.

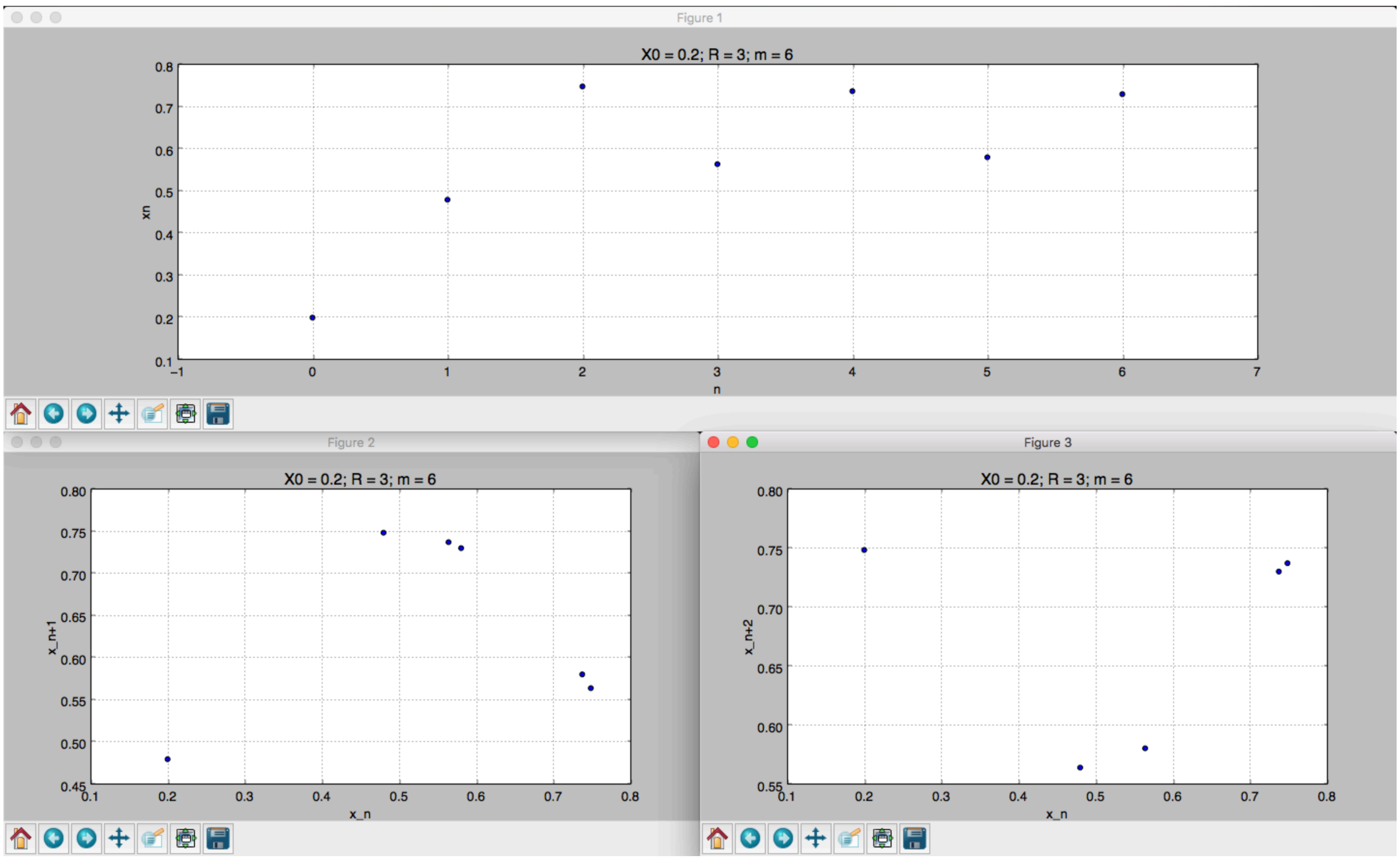
When R is fixed to 2.5, the initial conditions do not change the fixed point attractor. This means that the initial conditions are all in a “well of attraction” that settles on .6 (in this case). What does change with the initial conditions is the approach to the fixed point. A small value displays an over-damped behavior, never over-shooting the fixed point, and asymptotically approaching it. On the other side, a larger initial condition will create an under-damped behavior where the system overshoots the fixed point but settles on it eventually

Please see the images to go along with these answers, as well as the interesting plots I found.

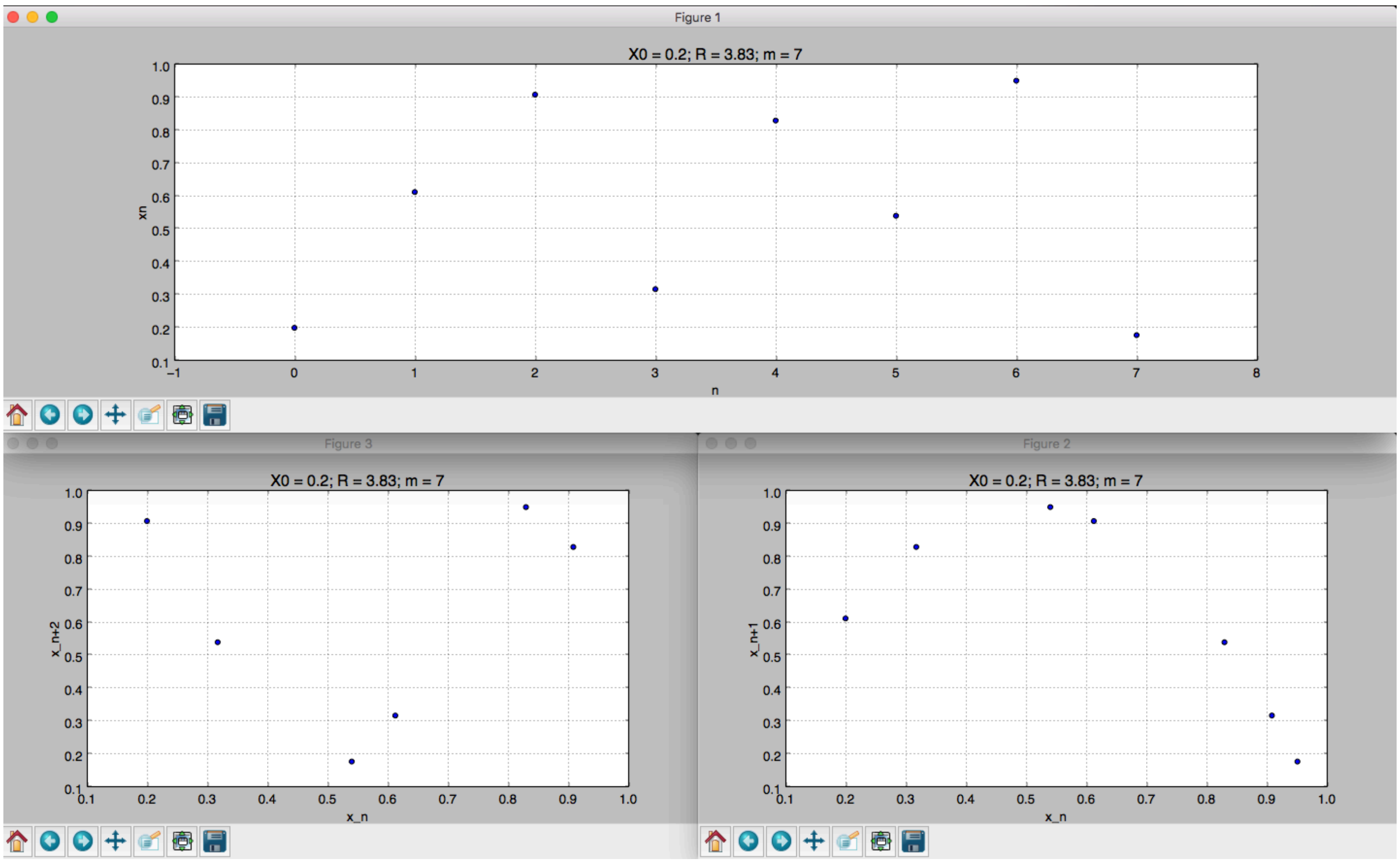
Simple fixed point attractor at .5



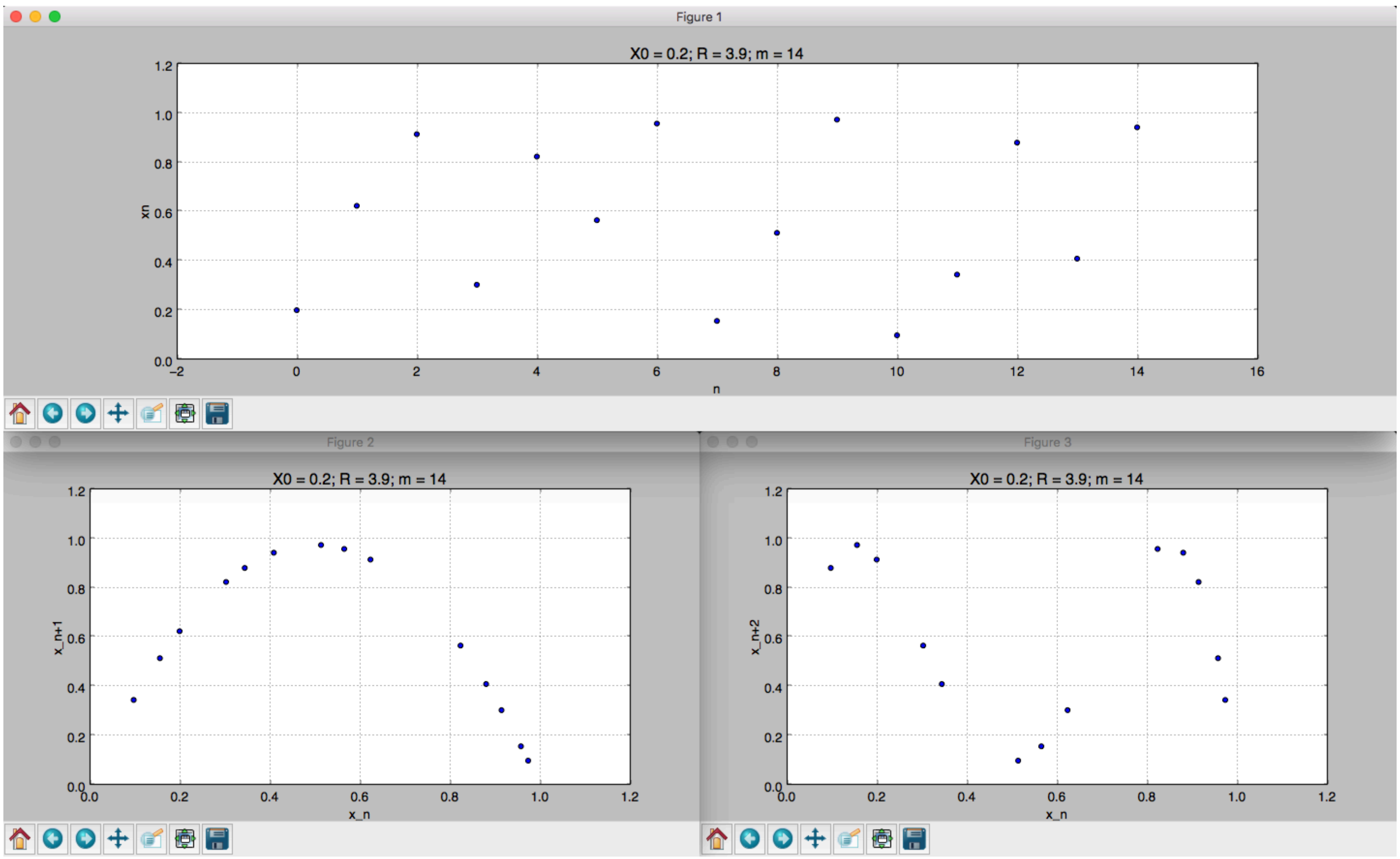
Simple limit cycle when R changes to 3



Chaotic Behavior shown at R = 3.83
The state-space plots show recognizable patterns, however



Interesting plots in all spaces at R = 3.9 shows similar behavior as above.



When R > 4, the plot quickly blows up for n > 10.
Notice the point near the bottom. From here the plot jumps by magnitudes in the negative direction