M636 MATHEMATICAL MODELING

Homework – Fall 2015

Name: _____

Instructions

- 1. Homework is considered, strictly, individual: all work should be your own, carried out individually, not in a group. Any form of cheating (including copying someone else work or allowing to be copied) will result in an "F" in the final grade of the course and a referral to the Dean's office for further action.
- 2. Show all analytical work.
- 3. Graphical and/or computational work can also be included in support of the analysis. But unless otherwise stated in the problem, answers based purely on graphical and/or computational work are considered incomplete.

I, ______, pledge that this homework is completely my own work, and that I did not consult, take, copy, borrow or steal any portions from any other person. I understand that if I violate this honesty pledge, I am subject to disciplinary action pursuant to the appropriate sections of the San Diego State University Policies.

1. (100 Pts.) Pattern Formation on a Discrete 2D Model

Write a MATLAB (or equivalent software) code to graph the attractor (long-term solution) of the following discrete dynamical system

$$z_{n+1} = \left(\lambda + \alpha |z_n|^2 + \beta Re(z_n^m)\right) z_n + \gamma \bar{z}_n^{m-1}$$

where z is complex-valued, α , β and γ are parameters. Try using the following parameters: m = 5, $\lambda = -2.34$, $\alpha = 2.0$, $\beta = 0.2$ and $\gamma = 0.1$. Set an initial condition for z_0 , iterate the code to eliminate transient behavior, and the plot the remaining points. Describe in your own words the emergent pattern. Now change the parameters and describe the effects on the pattern.