

MAT 22B Application 4 (Due 7/31 11:59 PM)

The goal of this assignment is play around with the logistic equation. Consider the logistic difference equation

$$u_{n+1} = \rho u_n (1 - u_n).$$

We will explore the behavior of solutions for different values of ρ .

1. Plot u_n vs n for the following values of ρ . Use at least 4 different initial values of $u_0 \in (0, 1)$ for each value of ρ .
 - (i) $\rho = 0.8$
 - (ii) $\rho = 1.5$
 - (iii) $\rho = 2.8$
 - (iv) $\rho = 3.2$
 - (v) $\rho = 3.5$
 - (vi) $\rho = 3.57$
 - (vii) $\rho = 3.6$
 - (viii) $\rho = 3.7$
 - (ix) $\rho = 3.9$
 - (x) $\rho = 4$
2. Create a cobwebbing diagram for the logistic difference equation for the following values of ρ . Use at least 4 different initial values of $u_0 \in (0, 1)$ for each value of ρ .
 - (i) $\rho = 0.8$
 - (ii) $\rho = 1.5$
 - (iii) $\rho = 2.8$
 - (iv) $\rho = 3.2$
 - (v) $\rho = 3.5$
 - (vi) $\rho = 3.57$
 - (vii) $\rho = 3.6$
 - (viii) $\rho = 3.7$
 - (ix) $\rho = 3.9$
 - (x) $\rho = 4$
3. What do you observe about the behavior of solutions for the different values of ρ ?
4. For a fixed value of ρ , what do you observe about the behavior of solutions? If they start close, do they remain close? Is this true for all values of ρ ?