MAT 22B Application 4 (Due 7/21 11:59 PM)

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

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

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?