

Chapter 1

- Know how to create and use difference equations and dynamical systems as models.
- Be able to calculate the first few values of a dynamical system (or sequence).
- Given data set, know how to estimate the parameters or constants in the different models [eg. k (or r) in population models].
- Know how to solve linear dynamical systems both analytically and numerically.
- Understand, know when to use, and be able to interpret the four population models: unconstrained growth, constrained growth, competing species, predator-prey species.
- For dynamical systems [both simple(single equation) and systems (2 or more equations)]:
 - Know how to read a scenario and develop a DDS model.
 - Be able to explain why coefficients appear as they do [e.g. positive/negative coefficients, same coefficients, coefficients adding to 1].
 - Be able to find equilibrium values and determine their stability.
 - Discuss the long term behavior of the system. [Does the system approach a limiting value? Are the solutions periodic?, etc.]
 - Understand when systems are sensitive to starting values and/or parameters.
- Be able to convert a DDS system to matrix form.
 - Find eigenvalues and eigenvectors.
 - Solve the system analytically and determine long-term behavior.
 - Determine stability of equilibrium solutions.
 - Sketch the eigenvectors and trajectories. Understand and draw trajectories for attractors, repellers, and saddle points.

There may be a small portion of the exam that is done on the computer. You will have to complete the non-computer part first before beginning on the computer portion. Calculators will be allowed on all parts of the exam.