

MATH 1360: Fall 2011

Exam I Review Topics

Reading: Chapters: 1-3 excluding 2.2.5, 3.2.1

Theory:

- Components of a modeling process
- Model classes

Discrete models

- Definition of a fixed point
- Linear stability analysis of a fixed point in 1D and 2D
- Definition and properties of a bifurcation diagram
- Jury conditions
- Basic population dynamic models (Logistic, Beverton-Holt, Nicholson-Bailey)

ODE models

- Definition and properties of nullclines
- Definition and properties of autonomous ODE systems
- Definition and classification of equilibria of 1D and 2D systems
- Elementary bifurcations and their properties

Methods

Discrete models

- Cobwebbing of 1D models
- Finding fixed points of 1D models, determining their stability
- Finding k-periodic orbits of 1D models, determining their stability
- Linearization of 2D discrete models - finding Jacobian
- Determination of fixed points and their stability in 2D models
- Computation of bifurcation diagrams for 1D and 2D models
- Interpretation of bifurcation diagrams

ODE models

- Determination of equilibria and their stability of 1D models
- Determination of equilibria and their classification for 2D models
- Phase-plane analysis of 2D models
- Bifurcation analysis of 1D systems
- Non-dimensionalization of a model
- Basic population models (Logistic, Fishery, Reaction kinetics models, Epidemic models)