Introduction to Nonlinear Dynamics for the Behavioral Sciences
Bifurcations

For each of the following equations, sketch all of the qualitatively different vector fields (i.e., phase portraits) that occur as r is varied, and the bifurcation diagram. State what kind of bifurcation occurs, and the critical value of r at which it occurs. Finally, simulate one of them for values of r at, above, and below the critical value; plot x vs. t for 2 initial conditions for each r value, and comment on the results.

$$\dot{x} = rx - x(1 - x)$$

$$\dot{x} = x - rx(1 - x)$$

$$\dot{x} = x - rx^3$$