Chapter 3 Homework, Part 1
Physics 459: Nonlinear Dynamics

You should complete this assignment by Thursday Feb 9, and made some progress by Thursday Feb 2.

Determine whether the stated flow undergoes a saddle-node or transcritical bifurcation as the parameter is varied. Sketch the qualitatively different vector fields, determine the critical value of r, and sketch the bifurcation diagram.

1. $\dot{x} = 1 + rx + x^2$
2. $\dot{x} = rx + x^2$
3. $\dot{x} = r - \cosh x$
4. $\dot{x} = rx - \ln(1 + x)$
5. $\dot{x} = x(r - e^x)$
6. $\dot{x} = r + \frac{1}{2}x - x/(1 + x)$
7. $\dot{x} = r + x - \ln(1 + x)$
8. $\dot{x} = x - rx(1 - x)$