Math 330  Homework 6  (Due Nov. 13)

For the following 1D dynamical systems, determine if and what bifurcations occur and at what parameter r values. Then sketch the bifurcation diagram of fixed points $x_c$ versus $r$.

1. $x' = 1 + rx + x^2$
2. $x' = rx - \ln(1 + x)$
3. $x' = x + \frac{rx}{1 + x^2}$
4. $x' = rx + x^3 - x^5$
5. $x' = (x - 1)^2 + (r - 1)^2 - 1$