Homework #13

Due: Jan 13, 2021

1. (M) chapter 8, choose one exercise from 12-16 and solve it.
2. Bonus: Find a paper of interest to you in which a Hopf bifurcation is discussed (mathematical or application) and explain the main findings.
3. (M) chapter 8, question 20.
4. Consider the stable and unstable manifolds of a hyperbolic fixed point of a C^r vector field in R^n (for example $n = 2$ and $n = 3$):

$$\frac{dx}{dt} = f(x), \quad x \in R^n$$

   (a) Can the stable (respectively, unstable) manifold intersect itself? Why?

   (b) Can the stable (respectively, unstable) manifold intersect the stable (respectively, unstable) manifold of a different fixed point? Why?

   (c) Can the stable manifold intersect the unstable manifold? If so, what is the nature of the intersection?

   (d) Can the stable (respectively, unstable) manifold intersect a periodic orbit? Why?

5. Consider questions 1a-d for the stable and unstable manifolds of a hyperbolic fixed point of a C^r diffeomorphism in R^2 (for example, the Henon map).