Exercises

Exercise 5.1 A limit cycle with analytic stability exponent. *There are only two examples of nonlinear flows for which the stability eigenvalues can be evaluated analytically. Both are cheats. One example is the 2-d flow*

$$\dot{q} = p + q(1 - q^2 - p^2)\,, \qquad \dot{p} = -q + p(1 - q^2 - p^2)\,. \tag{5.20}$$

Determine all periodic solutions of this flow, and determine analytically their stability exponents. Hint: go to polar coordinates $(q,p) = (r\cos\theta, r\sin\theta)$.

G. Bard Ermentrout

Exercise 5.2 The other example of a limit cycle with analytic stability exponent. *What is the other example of a nonlinear flow for which the stability eigenvalues can be evaluated analytically? Hint: email G.B. Ermentrout.*

Exercise 5.3 Yet another example of a limit cycle with analytic stability exponent. *Prove G.B. Ermentrout wrong by solving a third example (or more) of a nonlinear flow for which the stability eigenvalues can be evaluated analytically.*