Maths 761 Notes for Laboratory 8

1. Consider the differential equation

$$\dot{x} = \mu - x + x^3.$$

   (a) Use XPPAUT to compute the bifurcation diagram for the differential equation. Ensure that your step size and limits on the variables and parameter are set appropriately so that your bifurcation diagram looks nice.

   (b) Based on the evidence in the numerical bifurcation diagram, identify any bifurcations you see. How could you check whether you have identified the bifurcations correctly?

   (c) Draw phase portraits for representative values of μ.

2. The system

$$\begin{aligned} \dot{x} &= x(\mu + x^2 - 0.5y^2), \\ \dot{y} &= y(4 + x^2 - y^2). \end{aligned}$$

   was discussed in Lecture 15.

   (a) Use XPPAUT to compute a bifurcation diagram for the system. Experiment with different choices of the vertical axis in your bifurcation diagram to ensure that your picture shows all the bifurcations clearly.

   (b) Identify any bifurcations that you find in the system. Check that you have found the same bifurcations as were identified in Lecture 15.