MA573 - Fall 2019 Homework 4 - Due September 27th

Hirsh-Smale-Devaney Problems

Chapter 2: 10,

Chapter 3: 2(i)(iii),(iv),(vi),4,5,7,12,16 (hint: first draw the phase portraits for both cases: $x' = +y$ and $x' = -y$ and think about when the functions $g(y) = \pm y$ coincide with the function $f(y) = |y|$.

Non-textbook Problem(s):

Problem 1: Consider again the system from Problem 3.16 above:

$$\begin{aligned} x' &= |y| \\ y' &= -x. \end{aligned} \tag{0.1}$$

Use a numerical approach (such as Matlab's built in ODE solver "ode45" (or "ode15s")) to numerically solve the equation, plotting several solution trajectories $\{(x(t), y(t), \, | \, t \in \mathbb{R}\}$ to compare with your answer to 16 above. Some useful initial conditions to try would be points of the form $(c, -1)$, with c ranging from -3 to 3.