MA573 - Fall 2022 Homework 1 - Due September 9th

This homework is meant as a quick review of material from previous courses that will be needed throughout this course, and also to give you a feel on how problems will be graded throughout the course. In order allow you to get used to the grading rubric we will use for the course (see the syllabus), you will receive full credit on this assignment if you turn in a write-up with attempted solutions for *all* of the problems, regardless of their correctness. The problems will be marked up following the grading rubric given in the syllabus to give you feedback on how to prepare solutions.

Hirsh-Smale-Devaney Problems

Chapter 1: 2(a)

Additional Problems (memory jog of prerequisite courses):

Problem 1: *Find the eigenvectors and eigenvalues of the matrix* $A = \begin{pmatrix} 1 & \frac{1}{2} \\ 0 & 2 \end{pmatrix}$.

Problem 2: *Solve the following initial-value-problem and describe, in words, the asymptotics of the solution as* $t \to \pm\infty$.

$$x' = -3x, \qquad x(-3) = 1;$$

Problem 3: *Find the general solution of the following first-order inhomogeneous differential equation:*

$$\frac{dy}{dt} + 3y = 3\mathrm{e}^{-3t}$$

Problem 4: *Write-down the Taylor series centered at* $x = 0$, *up to 4th order, of the function* $f(x) = r - x + \mathrm{e}^{-x}$