DUE DATE: The homework problems from this handout are due **Monday, March 2nd**. There will also be a quiz in class on Monday, March 2nd.

Section 9.1: Overview of the Technique - The title here refers to solving linear equations $y' = Ay$ where A is a square matrix of any size with constant components. We will review how to find the eigenvalues and eigenvectors of 2 by 2 matrices and discuss how these come up in the solution of $y' = Ay$ when A is a 2 by 2 constant matrix.

homework: pg. 376-7, # 3, 8, 18, 21.

Section 9.2: Planar Systems - Restricting to $y' = Ay$ for A a 2 by 2 constant matrix, the eigenvalues of A can be real and distinct, a complex conjugate pair, or real and repeated. We will discuss the general solution to $y' = Ay$ in each case.

homework: pg. 389-91, # 16, 19, 25, 31, 37, 58a,b,c (you DO NOT need to produce the plot, just give the information about the eventual salt content and the reasons for your answer).

Section 9.3: Phase Plane Portraits - We already started to draw these in Chapter 8. Now, we add another key feature specifically for systems of the form $y' = Ay$: the general form of the phase portrait can be determined from the eigenvalues and eigenvectors of A (or equivalently from the trace and determinant of A). Key concepts:

1. saddle point, separatrix
2. nodal sink, nodal source
3. spiral sink, spiral source
4. center
5. improper node

homework: pg. 401-2, # 10, 11, 14, 16, 21, 22. You do not need to turn in anything from a numerical solver, but you could use pplane in MATLAB to verify that your answers are correct. BONUS: Draw the complete phase plane portrait for

$$y' = \begin{pmatrix} -3 & -1 \\ 4 & 1 \end{pmatrix} y.$$