Assignments 2/23-2/29

Reading: The textbook stretches out the eigenvector story through sections 4.1, 4.4, and 4.5 and more -- with a lot of duplication. We are going to slice up the material in a different direction so the later material does not require re-learning everything.

- Friday 2/24: Eigen-theory for 2x2 matrices. Read all of 4.1 and start on 4.4 (read Section 4.2, pp. 281-2, to learn how to compute 3x3 determinants for Monday).
- Monday 2/27: Eigen-theory for 3x3 matrices. Read 4.4 and 4.5 with the 3x3 case in mind.
- Wednesday 2/29: Eigen-theory for nxn matrices. Read 4.4 and 4.5. Also rest of 4.2.
- Friday 3/2: Prof Arms as guest instructor again. The hour will be devoted to a set of in-class problems.

Written Homework 7 (due Wednesday 2/29 at the start of class)

Instructions for certain problems from Sections 4.1, 4.4, 4.5 and Problem X

For these problems, follow these instructions, which are more and different from the instructions in the book. The extra steps are rather small, but quite important, so read carefully.

Steps 1 and 2 are essentially what the book calls for in most cases. Steps 3 and 4, especially 4, are spelled out in a handout called "***How to write a set of eigen-equations as one matrix equation"*** that is linked to the Catalyst Workspace.

You won't lose any time by going ahead and solving for (1) and (2) first and then finishing (3) and (4) later if you prefer. These last steps are just a matter of observing and writing down information from your solutions – no more calculation.

(1) Find all the eigenvalues of matrix A. (Either one or two for the problems in 4.1.)
(2) Solve for all the eigenvectors for each eigenvalue. Choose a basis of eigenvectors for this eigenspace.
(3) For the *nxn* matrix A in the problem, write down a basis $\{S_1, S_2, \ldots, S_n\}$ of R^n consisting of eigenvectors of A – if such a basis exists.
(4) Write an equation of matrices, AS = SD, where A is the matrix in the problem, S is the matrix with columns S_1, S_2 for a 2x2 matrix A (or S_1, S_2, S_3 for a 3x3 matrix) and D is a diagonal matrix. Check that your equation is correct by multiplying both sides and comparing.

Hint: When computing the roots of the characteristic polynomial of a 3x3 matrix, if the determinant comes out in partially factored form (e.g., $(x-5)(x^2 + 3x + 2)$), use this factorization! *DO NOT* multiply it all out and then start factoring. One of your factors in this example is (x-5) already!

Problems with Special Instructions

Follow the instructions above for these problems and NOT the book's instructions.

- Section 4.1: **#2, 4, 5, 8**
- Section 4.4: **#7, 9**
- Section 4.5: **#12, 15**
- **Problem X:** Same instructions for matrix $\begin{bmatrix} 2 & 4 & 4 \\ 0 & 1 & 2 \\ 0 & 3 & 2 \end{bmatrix}$

Follow instructions in the book for the rest of the problems.

- Section 4.5: # 4, 5, 11

For these, show your work by hand, but you may wish to check the answers with technology for the answers not in the back of the book.

- Section 4.2: **#1, 2, 3, 4, 7 (count these as ONE problem)**

- Section 4.2: **#13, 15, 17, 19**