APMA 0360: HOMEWORK ASSIGNMENT #2
DUE DATE: SEP 21ST, 2011

Name: Grade:

EXERCISE 1
Using the Gaussian elimination method to solve the following systems of linear algebraic equations (or showing that there is no solution if it is the case):

(a) $$\begin{cases} x_1 + x_2 + x_3 = 2\,, \\ 2x_1 + x_2 = 1\,, \\ x_1 - 2x_2 - 5x_3 = 0\,. \end{cases}$$ (b) $$\begin{cases} x_1 - 2x_2 + 2x_3 = 0\,, \\ 2x_1 + x_2 - x_3 = 1\,, \\ - 2x_2 - 4x_3 = 0\,. \end{cases}$$

EXERCISE 2
Find all the eigenvalues and compute the eigenvectors associated with each eigenvalue of the following matrices:

(a) $\mathbf{A} = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$, (b) $\mathbf{B} = \begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix}$, (c) $\mathbf{C} = \begin{pmatrix} 1 & i \\ -i & -1 \end{pmatrix}$,

(d) $\mathbf{D} = \begin{pmatrix} 0 & \sqrt{2} & 0 \\ \sqrt{2} & 0 & \sqrt{2} \\ 0 & \sqrt{2} & 0 \end{pmatrix}$.

EXERCISE 3
Consider the system

$$\mathbf{x}' = A\mathbf{x}, \qquad \text{with} \qquad A := \begin{pmatrix} 2 & 2 \\ 2 & -1 \end{pmatrix}$$

a) Compute the eigenvalues and eigenvectors of the matrix A.
b) Find the general solution of the above equation.

EXERCISE 4
Consider the system

$$\mathbf{x}' = A\mathbf{x}, \qquad \text{with} \qquad A := \begin{pmatrix} -3 & -2 & 0 \\ 1 & -1 & 0 \\ 0 & 0 & -2 \end{pmatrix}$$

a) Compute the eigenvalues and eigenvectors of the above matrix.
b) Find the general solution of the above equation.

EXERCISEs from the textbook

- Section 7.3: Complete the Problems 26 and 32. Show your work. There, A^T denotes the transpose matrix of A, and A^* denotes the adjoint of A and is defined by taking the transpose and complex conjugate of A. A matrix is called Hermitian or self-adjoint if $A^* = A$.
- Section 7.3: Problem 34.
- Section: 7.4: Solve Problem 2 with $n = 2$ (that it, do only part a,b, and c in this problem).