Farhad Goodarzi
fgoodarzi@gwu.edu

1) Use Matlab "**inv**" command and solve the following systems of equations.

i)

$$10x_1-7x_2+0x_3=7$$
$$-3x_1+2x_2+6x_3=4$$
$$5x_1+x_2+5x_3=6$$

ii)

$$17x_1+2x_2+3x_3+4x_4=4$$
$$5x_1+6x_2+7x_3+8x_4=3$$
$$9x_1+10x_2+11x_3+12x_4=2$$
$$13x_1+14x_2+15x_3+16x_4 = 1$$

Another way to solve a system of linear equations is to use the matrix division operator " \". This method produces the solution using Gaussian elimination, without forming the inverse. Using the matrix operator is more efficient than using the matrix inverse and produces a greater numerical accuracy.

Now, try to solve the sets of equations in problem 1using matrix division operator and compare your answers with the pervious ones.

2) Define a 3x3 random Matrix and find the eigenvalues and eigenvectors and of M by using "**eig**" command.

3) The Matlab command "**rank"** provides an estimate of the number of linearly independent rows or columns of a full matrix. Find the rank and determinant of the given matrices.

i)

$$\begin{bmatrix} a & b & c \\ d & e & f \\ e & g & h \end{bmatrix}$$

ii)

$$\begin{bmatrix} 1 & -2 & 5 & 2 \\ 0 & 0 & 3 & 0 \\ 2 & -6 & -7 & 5 \\ 5 & 0 & 4 & 4 \end{bmatrix}$$

4) Using [L,U]=Lu(A) , we will be able to compute a permuted lower triangular factor in L and an upper triangular factor in U such that the product of L and U is equal to A.

Using [Q,R]=qr(A), we will be able to compute the values of Q and R such that A=QR. Q will be an orthonormal matrix, and R will be an upper triangular matrix.

Find L, U, Q and R matrices for each of the given matrices.

i)

$$\begin{bmatrix} 1 & 2 & -1 \\ -2 & -5 & 3 \\ -1 & -3 & 0 \end{bmatrix}$$

ii)

$$\begin{bmatrix} 1 & 3 & 2 \\ -2 & -6 & 1 \\ 2 & 5 & 7 \end{bmatrix}$$