Math 1080: Spring 2011

Homework #11 (due April 22)

Problem 1:

a) Determine the matrices **U**, $\mathbf{\Sigma}$, **V** in the singular value decomposition, $\mathbf{A} = \mathbf{U\Sigma V}^{\mathrm{T}}$, of the following matrices

$$\mathbf{A}_1 = \begin{bmatrix} -1 & -1 & -1 & -1 \\ 1 & 1 & -1 & -1 \\ -1 & 1 & 1 & 0 \end{bmatrix}$$

$$\mathbf{A}_2 = \begin{bmatrix} -2 & 2 & 0 & -2 \\ 2 & -1 & 1 & 3 \\ 0 & 1 & 1 & 1 \\ -2 & 3 & 1 & -1 \end{bmatrix}$$

b) Use the results of a) to find, in each case, the rank of $\mathbf{A}_i$ the norm $\|\mathbf{A}_i\|$ and the basis for null($\mathbf{A}_i$).

Computer Assignment 7:

a) Write a MATLAB function `[U,S,V]=svdsimp(A)` that computes the singular value decomposition, $\mathbf{A} = \mathbf{USV}^{\mathrm{T}}$, of a square $n \times n$ matrix **A**. The output variables are the $n \times n$ orthogonal matrix **U**, the $n \times n$ diagonal matrix **S**, and the $n \times n$ orthogonal matrix **V**.

b) Use the function `svdsimp` to calculate the singular values of the following matrix

$$\mathbf{A} = \begin{bmatrix} -3 & 2 & 6 & -8 & 0 & 5 & 3 \\ 2 & -9 & 5 & 3 & 4 & 4 & 1 \\ 0 & 0 & 4 & 2 & -1 & -1 & -1 \\ 3 & 2 & 0 & -3 & -3 & 1 & 1 \\ 5 & 4 & 4 & 4 & 5 & 8 & 9 \end{bmatrix}$$