

## STAT 893: Problem Set #1

Problem 1: Define the matrix

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

Use a computer program (R works really well) to perform the following calculations:

- a) Find  $\mathbf{AA}'$ .
- b) Find the eigenvalues of  $\mathbf{AA}'$ .
- c) Create a new matrix  $\mathbf{P}$  whose columns are the normalized eigenvectors of  $\mathbf{AA}'$ .
- d) Find  $\mathbf{P}'(\mathbf{AA}')\mathbf{P}$ .

Now, do the same four steps, but with  $\mathbf{A}'\mathbf{A}$  instead (what happens to the dimensions?). Note that computer programs often have difficulty with zeroes – anything less than, say, 1E-14 can safely be assumed to be zero.