

Matrix Algebra Review
Assignment 3
Points – 30

3.1

Eigenset

$$A = \begin{bmatrix} 1 & 3 \\ 3 & 1 \end{bmatrix}$$

- a. Find $\det(A)$. (2 pts)
- b. Find $\text{tr}(A)$. (1 pt)
- c. Find the eigenvalues of A . (4 pts)
- d. What is the relationship of $\det(A)$ to the eigenvalues of A ? (1 pt)
- e. What is the relationship of $\text{tr}(A)$ to the eigenvalues of A ? (1 pt)
- f. Find the normalized eigenvectors corresponding to the eigenvalues. (6 pts)

3.2

Eigenset of a 3 x 3 exchangeable correlation matrix

An “exchangeable” correlation matrix is one in which each covariate has the same correlation with each other. This represents a very simple correlation structure that is exploited in such applications as generalized estimating equations (“GEE”) that are used to model populations instead of subjects when random effects are present. Such a matrix is, e.g.,

$$A = \begin{bmatrix} 1 & 0.2 & 0.2 \\ 0.2 & 1 & 0.2 \\ 0.2 & 0.2 & 1 \end{bmatrix}$$

- a. Find $\det(A)$. (4 pts)
- b. The eigenvalues of A are 1.4, 0.8 and 0.8. Show they satisfy the characteristic equation for A . (6 pts)
- c. What is the relationship of $\det(A)$ to the eigenvalues of A ? (1 pt)
- d. If

$$V = \begin{bmatrix} 0.57735 \\ 0.57735 \\ 0.57735 \end{bmatrix}$$

Show that v is a normalized ($|v| = 1$) eigenvector corresponding to the eigenvalue 1.4. (4 pts)