

EEB 581, Problem Set Six

Due Tuesday, 2 March 2004

Recall that properties of the generalized inverse \mathbf{A}^- of the matrix \mathbf{A} are discussed on pages 183 - 187 for the notes on general linear models.

In **R**, the command for the generalized inverse of a matrix \mathbf{X} is given by `ginv(x)`. This function is in the package **MASS**, which must be loaded first. Hence, one type use the command `library(MASS)` at the beginning of your computer run to load this program, and then you can call `ginv` to your hearts content.

1 : Consider following system of equations:

$$4x_1 + 3x_2 + 6x_3 = 6$$

$$2x_1 + 6x_2 + 2x_3 = 4$$

- (a) Write this in matrix form, $\mathbf{Ax} = \mathbf{y}$.
- (b) Compute a generalized inverse \mathbf{A}^- of \mathbf{A} .
- (c) Recalling that a g-inverse satisfies $\mathbf{AA}^- \mathbf{A} = \mathbf{A}$, use **R** to compute $\mathbf{AA}^- \mathbf{A}$. Does this equal \mathbf{A} ?
- (d) What is one solution to these equation (e.g., compute $\mathbf{x} = \mathbf{A}^- \mathbf{y}$).
- (e) Recall that a consistent system of equations satisfies $\mathbf{AA}^- \mathbf{y} = \mathbf{y}$. Is our system consistent?
- (f) Use **R** to compute $\mathbf{I} - \mathbf{A}^- \mathbf{A}$
- (g) Recall that for a consistent system, all solutions can be written as $\mathbf{x} = \mathbf{A}^- \mathbf{y} + (\mathbf{I} - \mathbf{A}^- \mathbf{A}) \mathbf{c}$, where \mathbf{c} is any vector of constants. What is the family of solutions for this equation?