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

In $\mathbb{R}$, the command for the generalized inverse of a matrix $X$ is given by $\text{ginv}(X)$. This function is in the package $\text{MASS}$, which must be loaded first. Hence, one type use the command $\text{library(MASS)}$ at the beginning of your computer run to load this program, and then you can call $\text{ginv}$ 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, $Ax = y$.
(b) Compute a generalized inverse $A^-$ of $A$.
(c) Recalling that a g-inverse satisfies $AA^-A = A$, use R to compute $AA^-A$. Does this equal $A$?
(d) What is one solution to these equation (e.g., compute $x = A^-y$).
(e) Recall that a consistent system of equations satisfies $AA^-y = y$. Is our system consistent?
(f) Use R to compute $I - A^-A$
(g) Recall that for a consistent system, all solutions can be written as $x = A^-y + (I - A^-A)c$, where $c$ is any vector of constants. What is the family of solutions for this equation?