Mathematical Methods for Social Scientists
Math 196 (Sec 49), Spring 2006
Revision Sheet for Mid-term 2

This mid-term will cover those sections in the text book which we have studied in class upto 5.3 and will concentrate on the material covered since the first mid-term. The following questions are of the style you can expect in the exam.

(1) (a) Define what it means for a matrix to be upper triangular, lower triagular or diagonal.
(b) If A and B are upper triagular matrices, what can you say about AB and A^t?
(c) Write
$$\begin{pmatrix} 2 & 3 \\ -2 & 4 \end{pmatrix}$$
as a product of elementary matrices.

(2) (a) Give three conditions that are equivalent to a matrix A being invertible.
(b) Give a formula for the inverse of a matrix A.
(c) Calculate the inverse of
$$\begin{pmatrix} 2 & 6 & 3 \\ -2 & 8 & 4 \\ 0 & -2 & 0 \end{pmatrix}$$
using this formula.
(d) Compute the determinant of
$$\begin{pmatrix} 2 & 3 & 4 & 1 \\ 1 & 3 & 2 & 3 \\ 0 & 0 & 2 & 4 \\ 0 & 0 & 4 & 9 \end{pmatrix}$$

(3) (a) Define a subspace. Show that the set of solutions to a system of homogeneous equations is a subspace.
(b) Define the row space and column space of a matrix. Explain why the row spaces of two row equivalent matrices are the same.
(c) Define what it means for a set of vectors to be linearly independent.
(d) Show that $\{(0,1,1),(1,0,1),(1,1,0)\}$ is linearly independent.

(4) (a) Define what a basis is for a vector space. Define the dimension of a vector space — what fact means this definition is sensible?
(b) Give two conditions that are equivalent to being a basis.
(c) Is the set $\{(-1,2,1),(2,3,1),(7,7,2)\}$ linearly independent? Justify your answer. Find a basis for the span of this set.

It will be useful to review your homework and make sure you understand it. I will also ask questions from the text book.