Homework #1

Math 2010

Due January 27

All problems should be worked out on your own paper showing all necessary steps required in obtaining the solution. In addition, you should turned in an html file in the dropbox in D2L (see the Introduction to Matlab tutorial on publishing Matlab programs) which "checks" your answers to only numbers 1 and 2. In order to use Matlab to check your answers, you must define the augmented matrix in Matlab as a variable (see Introduction to Matlab tutorial on fundamentals of MATLAB), say A. Then to find the reduced row echelon form of the augmented matrix, use the command >> *rref(A)*. Once you have the reduced row echelon form of A, it is easy to pick off the solutions, the same as we do in class. This will allow you to make sure you have the correct answers and have not made some careless calculation errors. If you did not come to the same answer, then look back through your hand-written steps and find the mistakes and correct them. You will turn in the hand-written problems in class, and the published html file from Matlab in the dropbox in D2L.

1. Consider the system

$$\begin{array}{rcrcrcr} x_1 & & & - & 3x_3 & = & -2 \\ 3x_1 & + & x_2 & - & 2x_3 & = & 5 \\ 2x_1 & + & 2x_2 & + & x_3 & = & 4 \end{array}$$

   (a) Write the augmented form of the system.

   (b) Solve the system by hand using Gaussian elimination and back substitution. Make sure to show all necessary steps, labeling the elementary row operations performed in each step.

   (c) Continue with the row echelon form found in part (a) and solve the system using Gauss-Jordan elimination (i.e., obtaining the *reduced* row echelon form and using this form to solve the system). Make sure to show all necessary steps, labeling the elementary row operations performed in each step.

2. Solve the system by hand using either Gaussian elimination and back substitution or Gauss-Jordan elimination. Make sure to show all necessary steps, labeling the elementary row operations performed in each step.

   (a) $$\begin{array}{rcrcrcrcr} x_1 & + & x_2 & + & x_3 & - & 2x_4 & = & 3 \\ 2x_1 & + & x_2 & + & 3x_3 & + & 2x_4 & = & 5 \\ & & -x_2 & + & x_3 & + & 6x_4 & = & 3 \end{array}$$

   (b) $$\begin{array}{rcrcrcr} x_1 & + & 2x_2 & + & 3x_3 & = & 9 \\ 2x_1 & - & x_2 & + & x_3 & = & 8 \\ 3x_1 & & & - & x_3 & = & 3 \end{array}$$

   (c) $$\begin{array}{rcrcrcr} 2x_1 & - & x_2 & + & x_3 & = & 3 \\ x_1 & - & 3x_2 & + & x_3 & = & 4 \\ -5x_1 & & & - & 2x_3 & = & -5 \end{array}$$

3. By hand, find values of a, b, and c (if possible) such that the system

$$\begin{array}{rcrcrcr} x & + & y & & & = & 0 \\ & & y & + & z & = & 0 \\ x & & & + & z & = & 0 \\ ax & + & by & + & cz & = & 0 \end{array}$$

   (a) has a unique solution.

   (b) has no solution.

   (c) has an infinite number of solutions.