Math 2250−4

Week 5 concepts and homework, due February 10.

Recall that problems which are not underlined are good for seeing if you can work with the underlying concepts; that the underlined problems are to be handed in; and that the Friday quiz will be drawn from all of these concepts and from these or related problems.

3.1−3.3: linear systems of (algebraic) equations; augmented matrices and Gaussian elimination to compute reduced row−echelon form. Explicitly specifying the solution space by backsolving the reduced row echelon form of the augmented matrix. Depending on your previous experience and background, you may need to practice this algebra a lot, or just a little. So, I've included a fairly large number of good practice problems in addition to the ones you'll hand in.

3.1: 1, **4**, 11, **16**, 17, 19, 23, **24**, **27**, 29, 32, 33, **34**
3.2: 7, **8**, 9, 13, 17,**20**, 29, 30;
3.3: 13, **20**, 33, **34**;

3.4: matrix operations and algebra

3.4: 3, 5, 7, **10,** 13**,** **16**, 19, 27, 31, **32**, **34**, 39, **40**, 44.

w5.1 . Consider the matrix A in problem 3.3.20 above.
a) Use technology to compute the reduced row echelon form, which you've already computed by hand. (If you don't want to use Maple, Matlab, or your graphing calculator, find an appropriate applet on the internet.
b) Use this reduced row echelon form write down the general solution $\underline{\boldsymbol{x}}$ to the homogeneous matrix equation $A\,\underline{\boldsymbol{x}} = \underline{\boldsymbol{0}}$. Express your solution in "linear combination form", i.e. as a sum of scalar multiples of several vectors, where the scalars are your free parameters.
c) Notice that the third column of A is $\boldsymbol{col}_3(A) = [1, 8, 5]^T$. (The superscript T means to transpose the given row vector into a column vector.) And,

$$\begin{bmatrix} 3 & 6 & 1 & 7 & 13 \\ 5 & 10 & 8 & 18 & 47 \\ 2 & 4 & 5 & 9 & 26 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 1 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ 8 \\ 5 \end{bmatrix}.$$

In other words, the vector $\underline{\boldsymbol{e}}_3 = [0, 0, 1, 0, 0]^T$ is a particular solution to $A\,\underline{\boldsymbol{x}} = \boldsymbol{col}_3(A)$. Use your work from **b)** and the result of 3.4.40 to deduce the complete solution set to $A\,\underline{\boldsymbol{x}} = \boldsymbol{col}_3(A)$.
d) Check your answer to (c) with techonology.