Linear Algebra 2270-2
Due in Week 2

For the second week, the plan is to start chapter 1. Here's the list of problems, followed by problem notes and a few answers. The Student Study Guide has answers and solutions to the odd problems. The textbook has answers to the odd problems.

Problem week2-1. State the *Three Possibilities* for the solution $\vec{x}$ of a matrix system $A\vec{x} = \vec{b}$. Give an example of each possibility in dimension 3, then describe the geometry of each example.

Problem week2-2. In section 2.8 the *nullspace* of a matrix A is defined to be the set of all solutions $\vec{x}$ to the equation $A\vec{x} = \vec{0}$. Give a 3×3 example in both matrix form and equation form. Then define *nullspace* for a system of equations.

Section 1.1. Exercises 7, 11, 19, 25, 34.

Section 1.2. Exercises 1, 7, 11, 13, 15, 17, 19, 23, 25, 28, 33.

Section 1.3. Exercises 11, 13, 15, 21, 25, 34.

Some Answers

Exercise 1.1-34:

(1) Begin by interchanging R1 and R4, then create zeros in the first column.

(2) Scale R1 by 1 and R2 by 1/4, create zeros in the second column, and replace R4 by R4 + R3.

(3) Scale R4 by 1/12, use R4 to create zeros in column 4, and then scale R3 by 1/4.

(4) The last step is to replace R1 by R1 + (1)R3.

The solution is (20, 27.5, 30, 22.5).

Exercise 1.2-28: Every column in the augmented matrix except the rightmost column is a pivot column, and the rightmost column is not a pivot column.

Exercise 1.3-34: a. For $j = 1, ..., n$, $u_j + (-1)uj = (-1)u_j + u_j = 0$, by properties of $\mathcal{R}$. By vector equality, $\vec{u} + (-1)\vec{u} = (-1)\vec{u} + \vec{u} = \vec{0}$.

b. For scalars c and d, the jth entries of $c(d\vec{u})$ and $(cd)\vec{u}$ are $c(du_j)$ and $(cd)u_j$, respectively. These entries in $\mathcal{R}$ are equal, so the vectors $c(d\vec{u})$ and $(cd)\vec{u}$ are equal.