

Homework 3

In this homework you will practice solving some systems by elimination, and also begin some more general matrix operations.

Problems in Strang:

§2.2: # 12, 15

§2.3: # 1, 12

§2.4: # 1, 3, 6

And the following problems:

To estimate the “dimension” of the set of solutions of a linear system, we compute

$$\# \text{unknowns} - \# \text{equations}$$

In “most” cases, this actually gives the correct dimension of the solution set. However, in general, the set of solutions may have a dimension that disagrees with the “expected dimension” above. The reason that this might happen is that there is a *row relation*: one row (equation) can be written as a linear combination in terms of the other rows.

- A. Solve the following system by putting it in matrix form and then transforming it to Reduced Row Echelon Form (RREF) using the elimination algorithm:

$$\begin{cases} x + 2y + 3z = 4 \\ x + 2y + 4z = 6 \\ x + 2y + 5z = 8 \end{cases}$$

Does the set of solutions have the expected number of dimensions? Why or why not? (Recall that to solve a system after putting in RREF, find the pivot variables and free variables, then begin solving in terms of the free variables.)

- B. Do the same for the following system:

$$\begin{cases} x_1 + 2x_2 + x_3 + 0 + 2x_5 = 1 \\ x_1 + 2x_2 + 2x_3 - 3x_4 + 3x_5 = 1 \\ x_1 + 2x_2 + 0 + 3x_4 + 2x_5 = 3 \end{cases}$$

Does the set of solutions have the expected number of dimensions? Why or why not?