

Week 1 Worksheet

*Term: Spring 2020**Name:***Problem Gaussian Eliminations, Span, Pivots and Free Variables****Learning Goal:**

Students should be comfortable solving a three-variable system of equations using GE with the forward/backward elimination method. Additionally, they should know how to convert a solution with a free variable from equations describing the solution set into vector notation.

Description: Simple mechanical gaussian elimination problem + some insight about span and free variables

1. Consider the following set of linear equations:

$$1x - 3y + 1z = 4$$

$$2x - 8y + 8z = -2$$

$$-6x + 3y - 15z = 9$$

Place these equations into a matrix A , and row reduce A to solve the equations.

2. Consider another set of linear equations:

$$2x + 3y + 5z = 0$$

$$-1x - 4y - 10z = 0$$

$$x - 2y - 8z = 0$$

Place these equations into a matrix A , and row reduce A .

3. Convert the row reduced matrix back into equation form.
4. Intuitively, what does the last equation from the previous part tell us?
5. How many pivots are there in the row reduced matrix? What are the free variables?
6. What is the dimension of the span of all the column vectors in A ?
7. Now that we've established that this system has infinite solutions, does every possible combination of $x, y, z \in \mathbb{R}$ solve these equations
8. What is the general form (in the form of a constant vector multiplied by a variable t) of the infinite solutions to the system?