Contents

Chapter 1

Systems of Linear Equations and Matrices

1.1 Introduction to Systems of Linear Equations

Definition. A *linear equation* can be written as

$$a_1 x_1 + a_2 x_2 + \cdots + a_n x_n = b$$

A *homogenous linear equation* has $b = 0$, so

$$a_1 x_1 + a_2 x_2 + \cdots + a_n x_n = 0$$

Definition. A *system of linear equations* or *linear system* is a finite set of linear equations.

A *solution* of a system of linear equations is a system sequence of n numbers

$$x_1 = s_1, \ldots, x_n = s_n$$

that makes each equation a true statement.

We often write solutions as $(s_1, s_2 \ldots, s_n)$, called an *ordered n-tuple*.

Go over two and three variables and number of solutions. Cover *consistent* and *inconsistent*. Maybe *dependent*.

- $\begin{cases} x + y = 6 \\ x - y = 2 \end{cases}$
- $\begin{cases} x - 2y = 4 \\ 2x - 4y = 8 \end{cases}$

Talk about parametric solutions $x = f(t)$ and $y = t$.

- $\begin{cases} 5x - 2y - 5z = 1 \\ 10x - 4y - 10z = 2 \\ 15x - 6y - 15z = 3 \end{cases}$

Talk row operations. Do a few examples with solutions.

1.1.1 Homework

#10, 15

1.2 Gaussian Elimination

Define *row echelon form* and *reduced row echelon form*.

Ex 1.

- $$\begin{cases} x_1 - x_2 + 2x_3 - x_4 = -1 \\ 2x_1 + x_2 - 2x_3 - 2x_4 = -2 \\ -x_1 + 2x_2 - 4x_3 + x_4 = 1 \\ 3x_1 - 3x_4 = -3 \end{cases}$$

1.2.1 Homework

#7,21,22,25