9.3 Systems of Equations and Matrices

Definition 9.3.1

A matrix is an array (or arrangement) of numbers, arranged in rows and columns

e. g.
$$A = \begin{pmatrix} 2 & 1 & 3 \\ 4 & 2 & 1 \\ 5 & 0 & 3 \end{pmatrix}$$
 is a matrix with 3 rows and 3 columns.

The numbers in a matrix are called **elements** of the matrix.

Notation:
$$A_{3\times3} = [a_{ij}]$$
 ("Row-Column")

where:

 $A_{3\times3} = [a_{ij}]$ is the element in Now i and column j

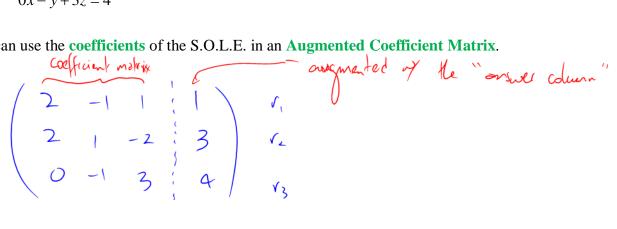
 $A_{3\times3} = [a_{ij}]$ $A_{3\times3} = [a_{ij}]$

Using matrices to solve Systems of Linear Equations

Consider the system:

$$2x - y + z = 1$$
$$2x + y - 2z = 3$$
$$0x - y + 3z = 4$$

We can use the coefficients of the S.O.L.E. in an Augmented Coefficient Matrix.



We solve systems of linear equations using matrices by employing Elementary Row Operations! There are two techniques:

1) Gaussian Elimination

Here the goal is to get the **ACM** into the form:

After "simplifying" a matrix using Grassian Elimination, the matrix is said to be in **Row Echelon Form**

2) Guass – Jordan Elimination

Here the goal is to get the ACM into the form:

Reduced Fow Echelon

A3K) X J383 - A3K3

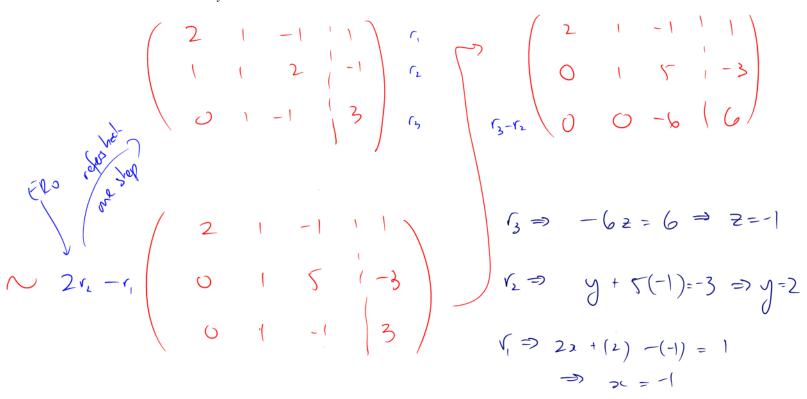
Example 9.3.1

Use Gaussian Elimination to solve the system:

$$2x + y - z = 1$$

$$x + y + 2z = -1$$

$$0x + y - z = 3$$



· ()1, y, z) = (-1, 2, -1)

Example 9.3.2

Use Guass – Jordan Elimination to solve:

$$x - y + z = 0$$

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

$$2x - 2y + z = -11$$

Class/Homework for Section 9.3

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