

# EE1390 MATRIX PROJECT

ME18BTECH11035(SAHAJ GUPTA)  
,MS18BTECH11017(BHARADWAJ PEELA)

February 15th 2019

Question in GEOMETRICAL FORM

Question: Given  $2x - y + 2z = 2$ ,  $x - 2y + z = -4$ ,  $x + y + kz = 4$  then the value of 'k' such that the system of equation has NO unique solution

MATRIX APPROACH: The matrix form of any plane is of the form

$$\mathbf{r} \cdot \mathbf{x} = \mathbf{p}$$

The equations given to us are :

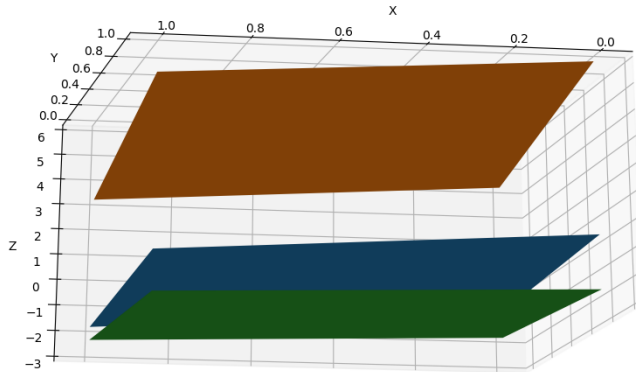
$$\begin{bmatrix} 2 & -1 & 2 \end{bmatrix} \cdot \mathbf{X} = 2$$

$$\begin{bmatrix} 1 & -2 & 1 \end{bmatrix} \cdot \mathbf{X} = -4$$

$$\begin{bmatrix} 1 & 1 & k \end{bmatrix} \cdot \mathbf{X} = 4 \text{ where } \mathbf{X} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

Each equation represents a plane and the point of intersection is determined by

The problem can be written in matrix form as



SOLUTION: we know that a given system doesn't contain any solution if the determinant of the coefficient matrix is zero

 $\Rightarrow$ 

$$\det(A) = \begin{vmatrix} 2 & -1 & 2 \\ 1 & -2 & 1 \\ 1 & 1 & k \end{vmatrix} = 0$$

$$\Rightarrow 3k - 3 = 0 \Rightarrow k = 1$$

# GRAPHICAL VERIFICATION

Now the solution is verified using a graph which is plotted in python we plot each of the lines which is obtained by the intersection of any two planes and we can clearly see that,  **$k=1$**  the lines clearly don't intersect.

**Therefore , the system of equations doesn't have any solution**

