Determinant

9. Non – Homogeneous System

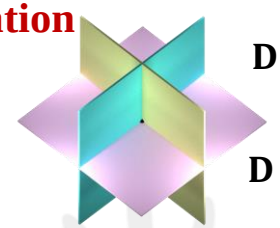
D	D_x, D_y, D_z	Type of Solution	Type of System
$\neq 0$	Atleast any one of $D_x, D_y, D_z \neq 0$	Unique Non – Trivial	Consistent
$\neq 0$	$D_x = D_y = D_z = 0$	Unique / Trivial	Consistent
$= 0$	$D_x = D_y = D_z = 0$	Infinite Sols.	Consistent
$= 0$	$D_x \neq 0$, or $D_y \neq 0$, or $D_z \neq 0$	No Solution	Inconsistent

10. Geometric Interpretation

$a_1x + b_1y + c_1z = d_1$ .... (i)

$a_2x + b_2y + c_2z = d_2$ .... (ii)

$a_3x + b_3y + c_3z = d_3$ .... (iii)



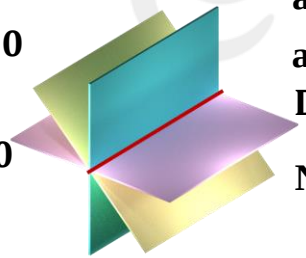
$D \neq 0$ Atleast any one of $D_x, D_y, D_z \neq 0$

Non - Trivial solution

$D \neq 0$ $D_x = D_y = D_z = 0$ Trivial solution

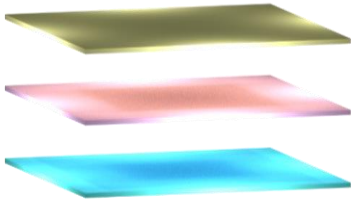
$D = 0$ $D_x = D_y = D_z = 0$

Infinite Sols.



$D = 0$ $D_x = D_y = D_z = 0$

No Solution



$d_1 = d_2 = d_3$

$a_1x + b_1y + c_1z = d_1$ .... (i)

$a_1x + b_1y + c_1z = d_2$ .... (ii)

$a_1x + b_1y + c_1z = d_3$ .... (iii)

$D = 0$ $D_x = D_y = D_z = 0$

Infinite Solution

$D = 0$ $D_x = D_y = D_z = 0$

No Solution

11. Homogeneous System

$a_1x + b_1y + c_1z = d_1$ .... (i)

$a_1x + b_1y + c_1z = d_2$ .... (ii)

$a_2x + b_2y + c_2z = d_3$ .... (iii)

$D = 0$ $D_x \neq 0$, or $D_y \neq 0$, or $D_z \neq 0$

No Solution

1. $D_x = D_y = D_z = 0$

2. Atleast one solution in this case is :
   $x = 0, y = 0, z = 0$

   known as Trivial solution

   $a_1x + b_1y + c_1z = 0$ .... (i)

   $a_2x + b_2y + c_2z = 0$ .... (ii)

   $a_3x + b_3y + c_3z = 0$ .... (iii)

3. System is always Consistent

4. If Sol. exist other than ($x = 0, y = 0, z = 0$) , then that system has Non – Zero Sol. or Non – Trivial Sol.

D

$D_x = D_y = D_z = 0$

$D \neq 0$

1. Unique Solution
   $(x = 0, y = 0, z = 0)$

2. Trivial Solution
   Zero Solution

$D = 0$

1. ∞ No. of Solutions

2. Non – Trivial Solution
   Non – Zero Solution

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