EE5120

Assignments → 4-7
Quizzes → 4
End sem → 1
Course project → Youtube ppts.

[H slots Mon 2p, Tue 3.30p, Thu 5p]

Gilbert Strang - Linear Algebra & its applications.

Entire course:

$Ax = b$, $Ax = \lambda x$

1. Linear system of equations
2. Vector spaces
3. Orthogonality
4. Eigenvalue problem
5. Positive definite matrices
6. Singular Value decomposition.

— ∞ —

Notation: Upper case → Matrices
lower case → vectors & scalars
Real nos / Complex nos

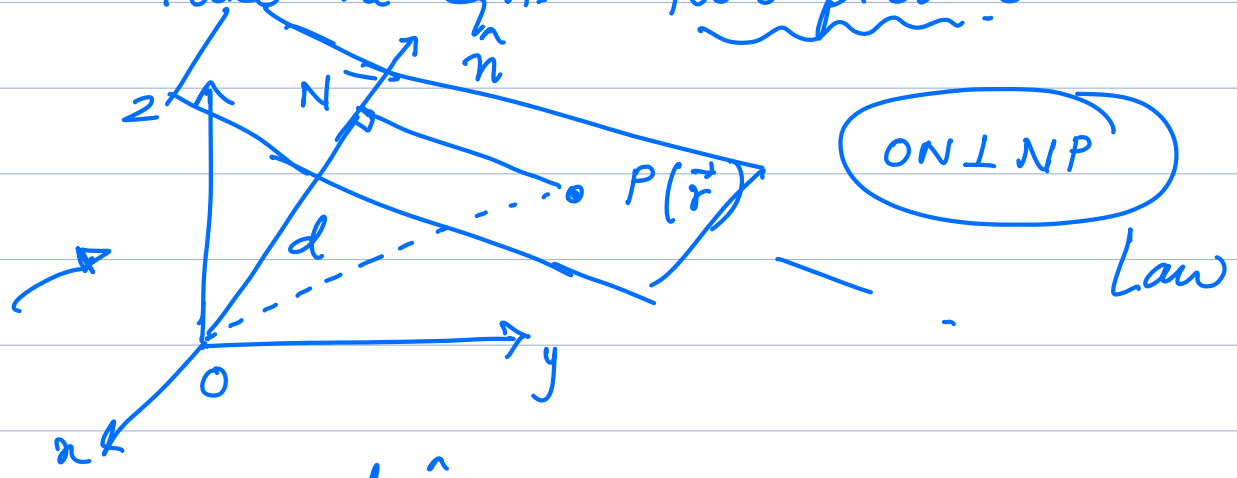
—

$5x + 6y + 3z = 7$ $\quad Ax = b$

$$\begin{bmatrix} 5 & 6 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = [\,]$$

A ↑

Take one eqn. "Row picture"



ON ⊥ NP

Law

ON : $d\,\hat{n}$

NP : $\vec{r} - d\,\hat{n}$

eqn: $ON \perp NP \Rightarrow (d\,\hat{n}) \cdot (\vec{r} - d\,\hat{n}) = 0$

$$d\,\vec{r} \cdot \hat{n} = d^2$$

when $d \neq 0 \rightarrow \vec{r} \cdot \hat{n} = d.$

$\vec{r} = (x, y, z)$

$$x\,n_x + y\,n_y + z\,n_z = d.$$

① $\hat{n} = (5, 6, 3) \frac{1}{\sqrt{(\ )}}$

② $d = \frac{7}{\sqrt{(\ )}}$ distance from origin.

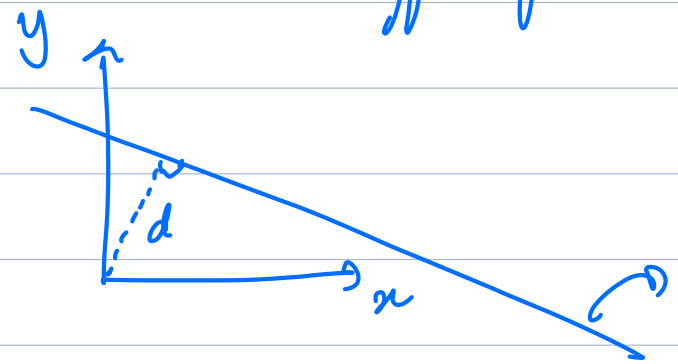
In general

$\vec{x} = (x_1, x_2, \ldots, x_n)$

$\hat{n} = (a_1, a_2, \ldots, a_n)$

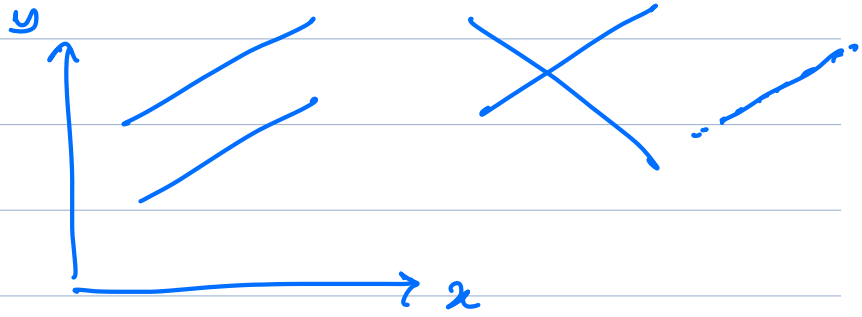
$\Rightarrow \vec{x} \cdot \hat{n} = \sum_{i=1}^{n} x_i a_i = d$

hyperplane → (n−1) dimensional plane in n dimensions.



↳ 1 eqn

2 eqns

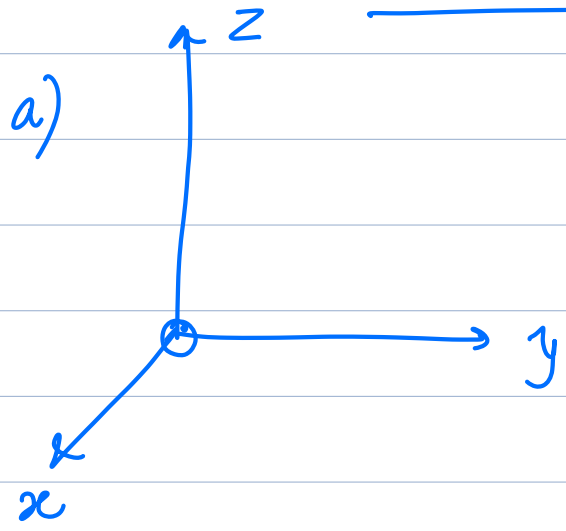


If i ask → $Ax = b$ when does a soln to $Ax = b$ exist?

A: n dimension

↳ If they intersect at a common point → unique soln

a)

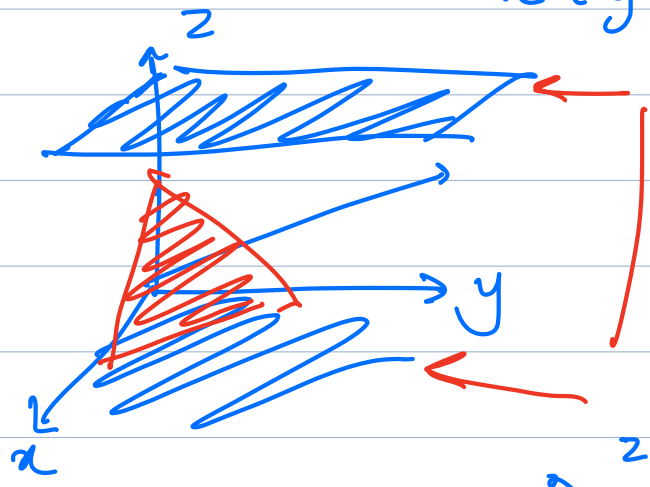


$x = 0$ → yz plane
$y = 0$ → xz plane
$z = 0$ → xy plane

b)

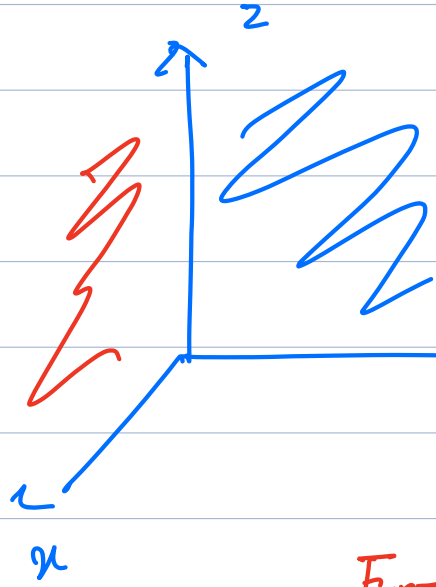
$z = 0$, $z = 5$

$x + y + z = 1$



No soln!

c) ∞ solns



$x = 0$ → yz
$y = 0$ → xz

Entire z axis!

3 possibilities:

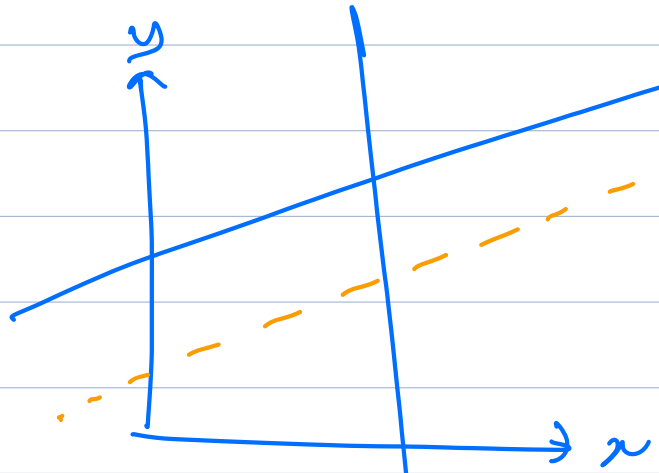
① Unique soln

② No soln

③ ∞ solns

Singular case

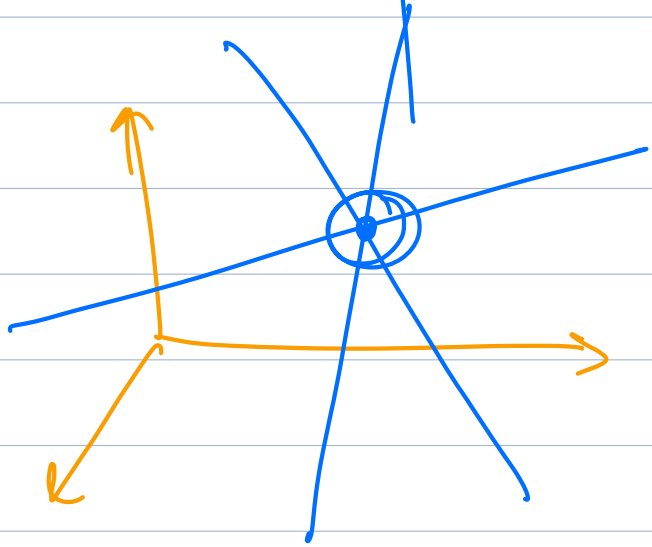
2 D



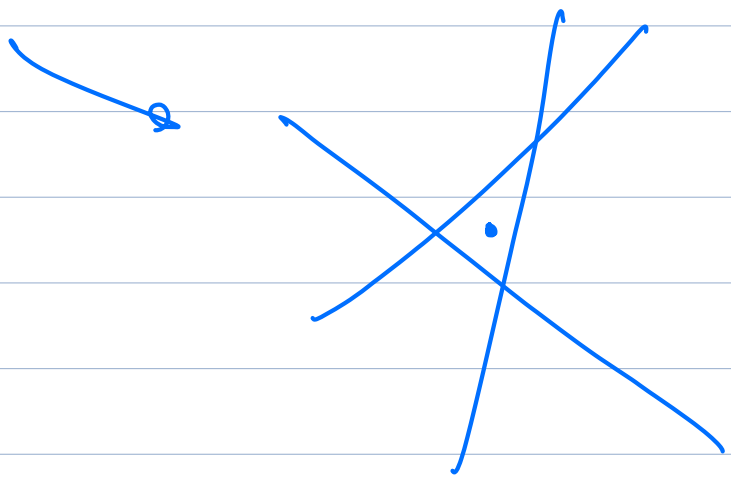
corrupted by noise

$Ax = b$

3 D



ideal world



$Ax = b$

$x = A^{-1}b$