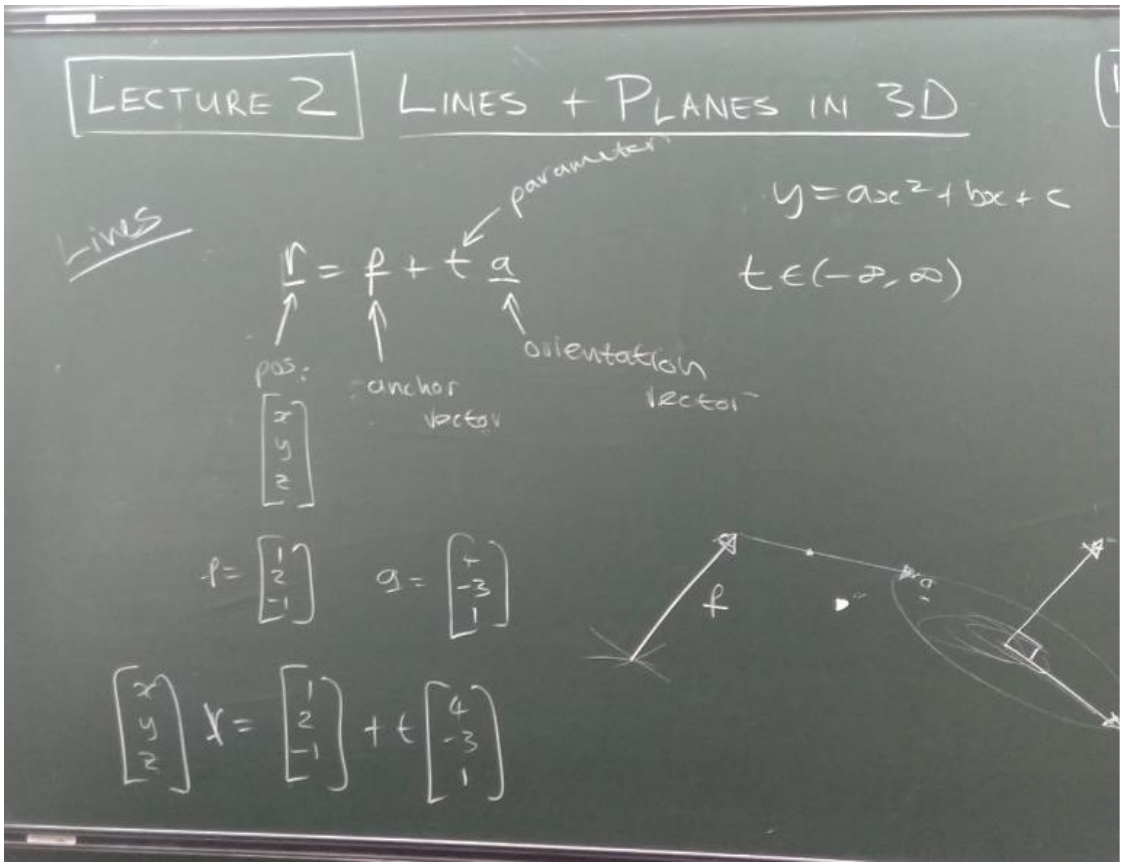
AM214-2023: LECTURE 2



SLIDE NUMBER 2 IS MISSING.

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Example Find line through $\begin{bmatrix}1\\2\\3\end{bmatrix}$, $\begin{bmatrix}-1\\5\\1\end{bmatrix}$

$\underline{x}_1 + \underline{q} = \underline{x}_2$

$\underline{q} = \underline{x}_2 - \underline{x}_1$

$\underline{r} = \underline{x}_1 + t(\underline{x}_2 - \underline{x}_1)$

$t \in (-\infty, \infty)$

$t \in [0, 1]$

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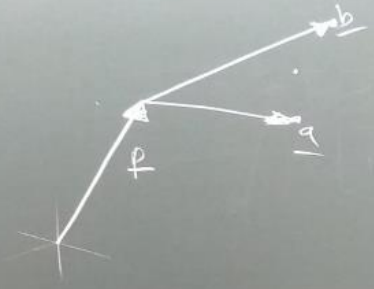
PLANES IN 3D:

Parametric form

$\underline{r} = \underline{p} + s\underline{q} + t\underline{b}$

$\begin{bmatrix}x\\y\\z\end{bmatrix}$ s t

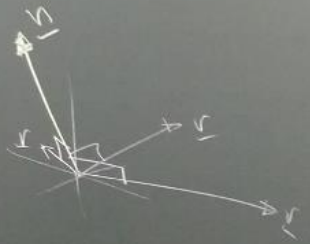


Normal form

given

$\underline{n} \cdot \underline{r} = 0$

$\begin{bmatrix}x\\y\\z\end{bmatrix}$



$\underline{n} = \begin{bmatrix}a\\b\\c\end{bmatrix}$ $\underline{n}^T\underline{r} = [a \quad b \quad c]\begin{bmatrix}x\\y\\z\end{bmatrix} = 0$

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$ax+by+cz=0$ ← Eq. of a plane through origin, and $\begin{bmatrix} a \\ b \\ c \end{bmatrix}$ is orthogonal to the plane.

Shift the plane to $\underline{p}$, replace $\underline{r}$ with $\underline{r}-\underline{p}$

$$\underline{n}\cdot(\underline{r}-\underline{p})=0$$

$$\underline{n}\cdot\underline{r}-\underline{n}\cdot\underline{p}=0$$

$$\underline{n}\cdot\underline{r}=\underline{n}\cdot\underline{p}$$

normal · pos. $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ = Scalar.

Normal to plane.

$\underline{n}=\underline{a}\times\underline{b}$

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Example: Find plane through $\underline{x}_1, \underline{x}_2, \underline{x}_3$.