Intro to vectors

- *Representing a point in a space*

Point / Vector :-

$P = [2, 3]$

x_1 component
x_2 component

2D dim

3D dim $q = [2, 3, 5]$ $(2, 3, 5)$

$p(2, 3)$

2D-space

$(0,0)$ 2

n-dim point

$x = [2, 3, 4, 1, 5, \ldots]$

3-D Space
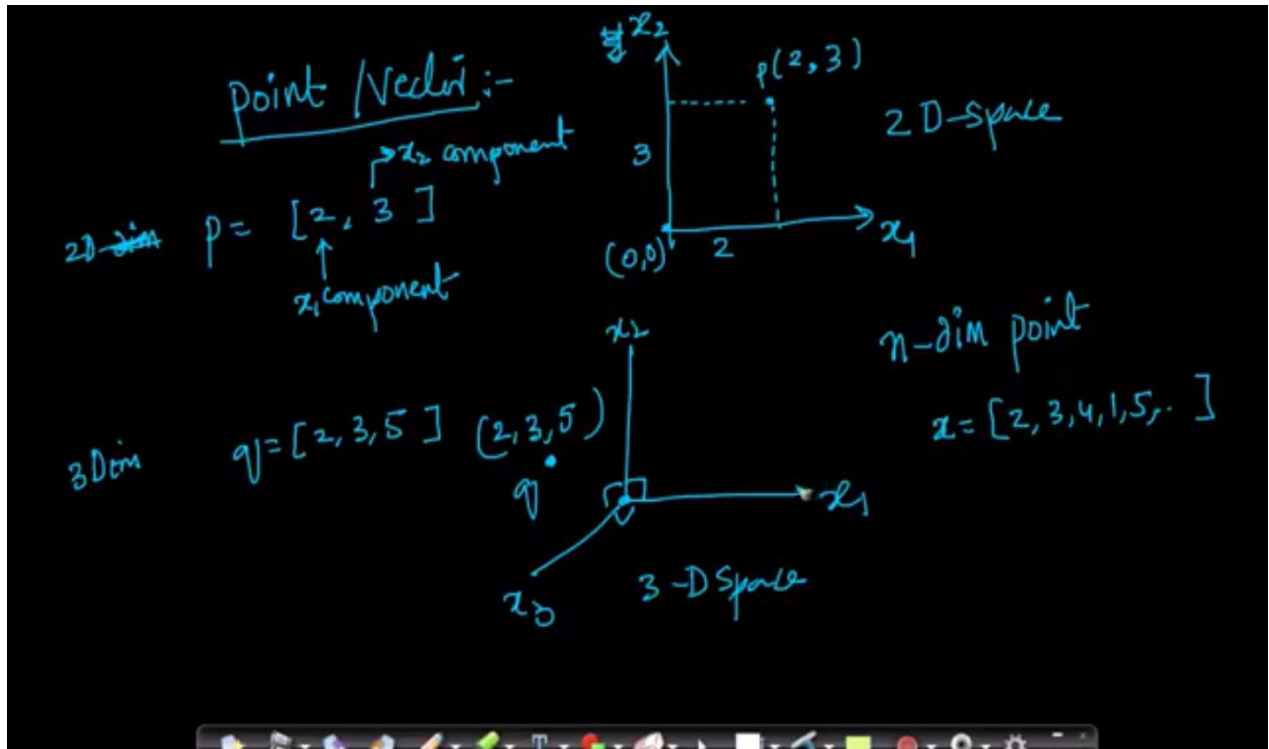
- *Distance of a point from Origin*

distance of a pt. from origin :

2D

$p(a, b)$

$(0,0)$

3D

$p(a, b, c)$

$d = $ dist origin & p

(2D) $d = \sqrt{a^2 + b^2}$ (pythagoras Thm)

(3D) $d' = \sqrt{a^2 + b^2 + c^2}$

(nD) $d = \sqrt{a_1^2 + a_2^2 + \cdots a_n^2}$

$p = [a_1, a_2, a_3, \ldots a_n]$

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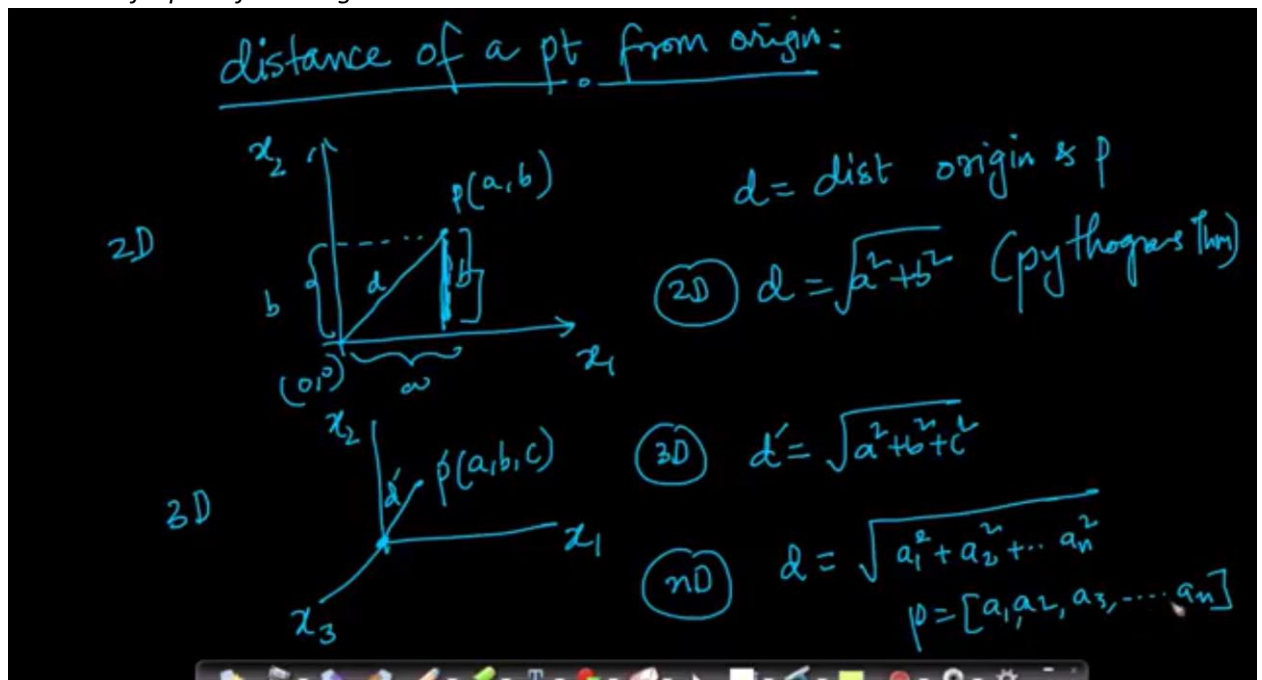
- *Distance between two points:*

dist b/w 2 pts

2D

$P(a_1, a_2)$

$q(b_1, b_2)$

$d = \sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2}$

3D

$P(a_1, a_2, a_3)$

$q(b_1, b_2, b_3)$

$d = \sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2}$

nD

$P(a_1, a_2 \cdots a_n)$

$q(b_1, b_2 \cdots b_n)$

$d_{pq} = sqrt\left(\sum_{i=1}^{n}(a_i - b_i)^2\right)$

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- *Row Vector and Column Vector*

✓ row vector: $A = [a_1, a_2, a_3 \cdots, a_n]_{(1 \times n)}$

columns

rows

$A_{1 \times n}$

✓ column vectr

$b = \begin{bmatrix} b_1 \\ b_2 \\ \vdots \\ b_n \end{bmatrix}$ $n \times 1$

columns

rows

$b_{n \times 1}$

$A_{m \times n}$ → double array of n arrays

$m \times n$