
LINEAR ALGEBRA

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1 $Ax = b$ and the four subspaces

1.1 Vectors

Column vector $v = (v_1, \dots, v_n) : (n\text{-dimensional vector})$

$$v = \begin{bmatrix} v_1 \\ \vdots \\ v_n \end{bmatrix}$$

Linear combination : vector addition + scalar multiplication

$$cv + dw$$

- dot product : $v \cdot w = v_1w_1 + \dots + v_nw_n$

When dot product is 0, they are perpendicular vectors

- length : $|v| = \sqrt{v \cdot v} = \sqrt{v_1^2 + v_2^2 + \dots + v_n^2}$

A unit vector u is a vector whose length equals 1

$u = v / |v|$ is a unit vector in the same direction as v