What is a linear combination of $\boldsymbol{v}_1, \ldots, \boldsymbol{v}_n$?

What is the name for the scalars multiplying the vectors in a linear combination?

When is a linear combination

$$\alpha_1 \, \boldsymbol{v}_1 + \cdots + \alpha_n \, \boldsymbol{v}_n$$

also an affine combination?

What is an affine space?

What conditions ensure that $\mathcal{V}$ is a vector space?

What are the names of the three definitions of matrix-vector multiplication and vector-matrix multiplication?

What is the linear-combination definition of matrix-vector multiplication?

What is the dot-product definition of matrix-vector multiplication?

What is the linear-combination definition of vector-matrix multiplication?

What is the dot-product definition of vector-matrix multiplication?

Coefficients

$\alpha_1\, \boldsymbol{v}_1 + \cdots + \alpha_n\, \boldsymbol{v}_n$

The set $\boldsymbol{a} + \mathcal{V}$ where $\mathcal{V}$ is a vector space.

When $\alpha_1 + \cdots + \alpha_n = 1$

- The linear-combinations definition,
- the dot-product definition, and
- the "ordinary" definition.

V1: $\mathcal{V}$ contains the zero vector,

V2: For every vector $\boldsymbol{v}$, if $\mathcal{V}$ contains $\boldsymbol{v}$ then it contains $\alpha\, \boldsymbol{v}$ for every scalar α, is closed under scalar-vector multiplication, and

V3: For every pair $\boldsymbol{u}$ and $\boldsymbol{v}$ of vectors, if $\mathcal{V}$ contains $\boldsymbol{u}$ and $\boldsymbol{v}$ then it contains $\boldsymbol{u} + \boldsymbol{v}$.

Entry r of $M * \boldsymbol{v}$ is the dot-product of row r with $\boldsymbol{v}$.

$M * \boldsymbol{v}$ is the linear combination of the columns of M where the coefficients are the entries of $\boldsymbol{v}$.

Entry c of $\boldsymbol{v} * M$ is the dot-product of $\boldsymbol{v}$ with column c of M.

$\boldsymbol{v} * M$ is the linear combination of the rows of M where the coefficients are the entries of $\boldsymbol{v}$.

What are the three definitions of matrix-matrix multiplication?

What is the matrix-vector definition of matrix-matrix multiplication?

What is the vector-matrix definition of matrix-matrix multiplication?

What is the dot-product definition of matrix-matrix multiplication?

What is the definition of a linear function?

What is the matrix-vector definition of matrix-matrix multiplication?

What is the vector-matrix definition of matrix-matrix multiplication?

Transpose of AB is ... ?

Outer product of u and v is ... ?

What is the null space of a matrix?

For each column-label s of B,

column s of $AB = A *$ (column s of B)

- The matrix-vector definition,
- the vector-matrix definition, and
- the dot-product definition.

Entry rc of AB is the dot-product of row r of A with column c of B.

For each row-label r of A,

row r of $AB =$ (row r of A) $* B$

Column c of A times B equals A times column c of B.

A function $f : \mathcal{U} \longrightarrow \mathcal{V}$ whose domain and codomain are vector spaces, such that

L1: For any vector $\boldsymbol{u}$ in the domain of f and any scalar α in $\mathbb{F}$,

$$f(\alpha\, \boldsymbol{u}) = \alpha\, f(\boldsymbol{u})$$

L2: For any two vectors $\boldsymbol{u}$ and $\boldsymbol{v}$ in the domain of f,

$$f(\boldsymbol{u} + \boldsymbol{v}) = f(\boldsymbol{u}) + f(\boldsymbol{v})$$

$B^T A^T$

Row r of A times B equals (row r of A) times B.

Null space of A is $\{\boldsymbol{x} \ : A * \boldsymbol{x} = \boldsymbol{0}\}$

$$\begin{bmatrix} \\ \boldsymbol{u} \\ \\ \end{bmatrix} \begin{bmatrix} \quad \boldsymbol{v}^T \quad \end{bmatrix}$$

The s, t element of $\boldsymbol{u}\boldsymbol{v}^T$ is $\boldsymbol{u}[s]\boldsymbol{v}[t]$