



Why

We can view the set of real-valued $n \times k$ matrices as a vector space over \mathbf{R} .

Definition

The *matrix sum* of two matrices $A, B \in \mathbf{R}^{n \times k}$ is the matrix $C \in \mathbf{R}^{n \times k}$ defined by $C_{ij} = A_{ij} + B_{ij}$. In other words, the matrix C is given by summing the entires of A and B “entry-wise”. We denote the matrix sum by $A + B$.

For $\alpha \in \mathbf{R}$, the α -scaled version of $A \in \mathbf{R}^{n \times k}$ is the matrix $C \in \mathbf{R}^{n \times k}$ given by $C_{ij} = \alpha A_{ij}$. In other words, the matrix C is given by scaling the entries of A “entry-wise”. We denote the α -scaled version of A by αA . These two definitions are justified by the following.

The $n \times k$ -matrix space is the vector space over $\mathbf{R}^{n \times k}$ in which addition is given by the matrix sumer and scalar multiplication by entry-wise scaling.¹

Subspace of symmetric matrices

The subset of symmetric n by n matrices is a subset of $\mathbf{R}^{n \times n}$.

¹Future editions will rework this sheet.

