Tensors are mathematical objects that generalize scalars, vectors, and matrices to higher dimensions. LaTeX provides excellent support for typesetting tensor notation, which is essential in physics, engineering, and advanced mathematics. This guide covers the essential LaTeX commands for working with tensors.

1 Basic notion

Definition 1. Let V be a $\mathbb{K}$-vectorial space. A form (or linear map) on V is an application from V to $\mathbb{K}$. For a vector space V, that we note $EV*$ it's dual space, which is the vector space of it's linear map on V.

Definition 2. A tensor of order (p, q), noted T, is a multi-linear map defined as

$$T : \underbrace{V^* \times \cdots \times V^*}_{p \text{ copies}} \times \underbrace{V \times \cdots \times V}_{q \text{ copies}} \to \mathbb{K} \tag{1}$$

Remark 1. By applying a multi-linear map T of type (p, q) to a basis e_j for V and a canonical co-basis ε_i for V^*,

$$T \begin{smallmatrix} i_1 \ldots i_p \\ j_1 \ldots j_q \end{smallmatrix} \equiv T\left(\boldsymbol{\varepsilon}^{i_1}, \ldots, \boldsymbol{\varepsilon}^{i_p}, \mathbf{e}_{j_1}, \ldots, \mathbf{e}_{j_q}\right), \tag{2}$$

a $(p + q)$-dimensional array of components can be obtained.