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0.1 The dual space forms a vector space

The dual space forms a vector space. We can define addition and scalar multiplication on members of the dual space.

The dimension of the dual space is the same as the underlying space.

We have defined the dual space. A vector in dual space will have also have components and a basis.

$$\mathbf{w} = \sum_i w_i f^j$$

So how we describe the components will depend on the choice of basis.

We choose the dual basis, the basis for V^* as:

$$\mathbf{e}_i \mathbf{f}^j = \delta_i^j$$

If the basis changes, so does the dual basis.

We write the dual basis as e^j