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### 0.1 Linear forms

A linear form is a linear map from a vector space to a scalar from the vector space's underlying field.

$$\text{hom}(V, F)$$

#### 0.1.1 Matrix operators

Linear forms can be represented as matrix operators.

$$v^T M = f$$

Where  $M$  has only one column.

#### 0.1.2 Stuff

$$f(M) = f(v)$$

We introduce  $e_i$ , the element vector. This is 0 for all entries except for  $i$  where it is 1. Any vector can be shown as a sum of these vectors multiplied by a scalar.

$$f(M) = f(\sum_{i=1}^m a_i e_i)$$

$$f(M) = \sum_{i=1}^m f(a_i e_i)$$

$$f(M) = \sum_{i=1}^m a_i f(e_i)$$

$$f(M) = \sum_{i=1}^m a_i f(e_i)$$

#### 0.1.3 Orthonormal basis

$$f(M) = \sum_{i=1}^m a_i$$