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### 0.1 Dot product

#### 0.1.1 Dot product is a bilinear form

This is a bilinear form, a mapping from two vectors in the same vector space to the underlying field.

$$V \times V \rightarrow F$$

#### 0.1.2 Calculating the dot product

This is calculated by multiplying each matching element, and summing the results.

$$u \cdot v = \sum_{i=1}^n u_i v_i$$

#### 0.1.3 Dot product on the complex numbers

Properties don't hold. Can get zero vectors from non-zero inputs. Get complex numbers from dot product on itself.

Inner products better deal with complex number fields. However they are not bilinear maps.