Show that
\[ \text{cap iv: } C \to V \otimes V^* \]
\[ e_v: V^* \otimes V \to C \]

\[ f \in V^* \]
\[ S \downarrow \]

\[ f \otimes 1 \in V^* \otimes C \]
\[ S \downarrow \]

\[ f \otimes (\sum e_i \otimes e^i) \in (V^* \otimes (V) \otimes V^*) \]

Tensor products are associative

Under \( ev \) \[ \sum f(e_i) \otimes e^i \in C \otimes V^* \]
\[ S \downarrow \]

Isomorphic

\[ \sum f(e_i) e^i \in V^* \]
Now we need to show

$$f = \sum_i f(e_i) e_i$$

Recall: $V = \sum_i v_i e_i$.

$$f(v) = f(\sum_i v_i e_i) = \sum_i f(e_i) v_i$$ since $f \in V^*$.

\[ \sum f(e_i) e_i (v) = \sum f(e_i) v_i \]

\[ \text{i^{th} component of } v \text{ in the basis } \{e_i\} \]

right!

good!

We can pull $f$ in since it's linear!