HW # 2

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MATH 260
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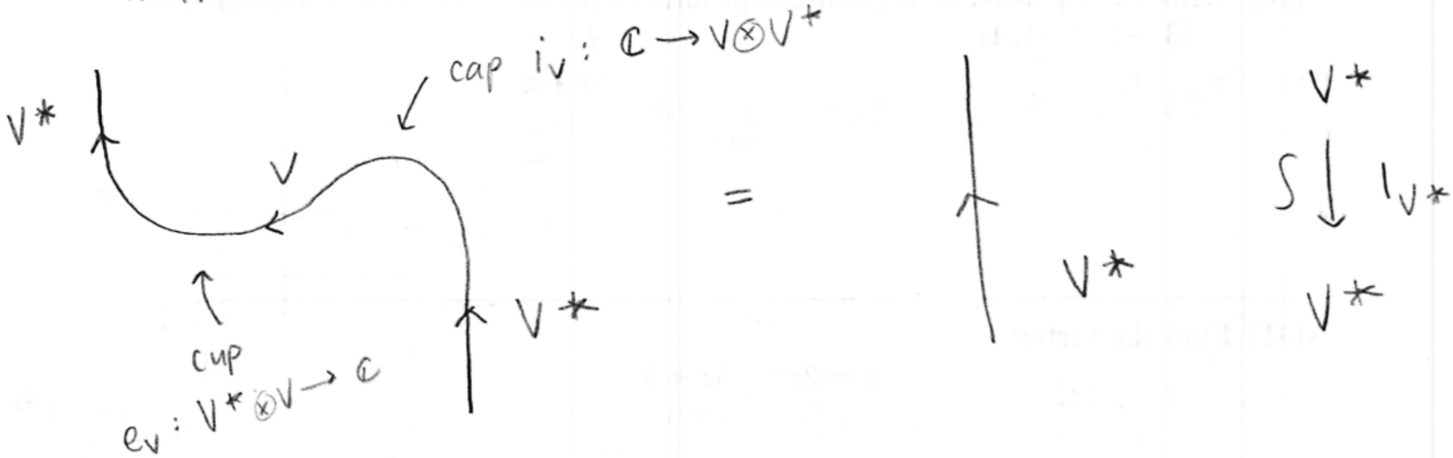
Show that



$$
\begin{tikzcd}
f \in \arrow[d, mapsto] & V^* \arrow[d, "\wr"'] & \text{isomorphic} \\
f \otimes 1 \in \arrow[d, mapsto, "\text{under } i_V"] & V^* \otimes \mathbb{C} \arrow[d] & 1_{V^*} \otimes i_V \\
f \otimes \left(\sum_i e_i \otimes e^i\right) \in \arrow[d, mapsto, "\text{under } e_V"', "\text{under } 1_{V^*}"] & \left(V^* \otimes (V) \otimes V^*\right) \arrow[d] & e_V \otimes 1_{V^*} \\
\sum_i f(e_i) \otimes e^i \in \arrow[d, mapsto] & \mathbb{C} \otimes V^* \arrow[d, "\wr"'] & \text{isomorphic} \\
\sum_i f(e_i) e^i \in & V^* &
\end{tikzcd}
$$

tensor products are assoc.
regroup ( ) ✓

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Now we need to show

$$f = \sum_i f(e_i)e^i$$

<u>Recall</u>: $v = \sum v^i e_i$

$$f(v) = f\left(\sum_i v^i e_i\right) = \sum_i f(e_i)v^i$$ since $f \in V^*$.

equal.

$$\sum_i f(e_i)\underbrace{e^i(v)}_{\substack{i^{th}\text{ component}\\ \text{of } v \text{ in the}\\ \text{basis } \{e^i\}}} = \sum_i f(e_i)v^i$$

right! good!

we can pull f in since it's linear!