

Advanced Linear Algebra MAT 315

Oleg Viro

03/03/2020, Lecture 5

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$$\begin{aligned} \Lambda(au + bw)(\varphi) &= \varphi(au + bw) \text{ by definition of } \Lambda \\ &= a\varphi(u) + b\varphi(w) \text{ by linearity of } \varphi \\ &= a(\Lambda(u)(\varphi)) + b(\Lambda(w)(\varphi)) \text{ by definition of } \Lambda \end{aligned}$$

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 $= (a\Lambda(u) + b\Lambda(w))(\varphi)$ by definition of linear operations in $(V^\vee)^\vee$. ■

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In the proof of Lemma, we used the assumption that V is finite-dimensional. Lemma holds true without this assumption. For infinite-dimensional space it requires tools like transfinite induction. But Theorem holds true only for a finite-dimensional V , anyway.

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