Lemma.

write out component by component

$\mathcal{U}R$ is a bounded lattice (**??**) with

$$\langle \mathcal{U}R, \leq_{\mathcal{U}R}, \bot_{\mathcal{U}R}, \top_{\mathcal{U}R}, \vee_{\mathcal{U}R}, \wedge_{\mathcal{U}R} \rangle = \langle \mathcal{U}R, \supseteq, R, \emptyset, \cap, \cup \rangle .$$