

$$\overline{\int^h \varrho} \leq \int^h \overline{\varrho}$$

$$\begin{aligned} \overline{\int^h \varrho}^2 &= \int^h \varrho^* \int^h \varrho = \int^h \underbrace{\varrho^* \varrho}_{\Re} = \Re \int^h \underbrace{\varrho^* \varrho}_{\Re} = \int^h \Re \underbrace{\varrho^* \varrho}_{\Re} \\ &\leq \int^h \overline{\underbrace{\varrho^* \varrho}_{\Re}} = \int^h \overline{\varrho^* \varrho} = \overline{\int^h \varrho^*} \int^h \varrho = \overline{\int^h \varrho} \int^h \varrho \end{aligned}$$