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H^1_{loc}

Definition. Local Sobolev space H^1_{loc}

Let $U \subseteq \mathbb{R}^n$ be open. The **local Sobolev space** of functions with derivatives in L^2_{loc}

$$H^1_{\text{loc}}(U) := \left\{ f \in L^2_{\text{loc}}(U) \middle| \forall 1 \leq j \leq n, \overset{\int}{\partial}_j f \in L^2_{\text{loc}}(U) \right\}$$

with norms

$$\|f\|_{H^1(\mathring{K})}$$

for each compact $K \subseteq U$.

Definition.

$$H^1_{\text{loc}} \cap \mathcal{C}(U)$$

$\mathcal{C}^\infty(U)$ is dense in $H^1_{\text{loc}} \cap \mathcal{C}(U)$

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And it has 4 siblings.

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  - Rf subobjects of and functions on $\mathbb{R}^n, T^n, S^n, \mathbb{C}^n$
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        - H-frac Fractional Sobolev spaces
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        - H1 loc R2 $H^1_{\mathrm{loc}}(U)$ for $U \subseteq \mathbb{R}^2$