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2. (10 points) **Answer:**

Proof. Let $\boldsymbol{v} \in \boldsymbol{L}$. By the property of $\boldsymbol{L}$, $\exists \epsilon > 0$ such that

$$\boldsymbol{L} \cap \{\boldsymbol{w} \in \mathbb{R}^m : \|\boldsymbol{w}\| < \epsilon\} = \{\boldsymbol{0}\}.$$

Then for $\boldsymbol{v} = \boldsymbol{0} \in \boldsymbol{L}$, it follows that

$$\boldsymbol{L} \cap \{\boldsymbol{w} \in \mathbb{R}^m : \|\boldsymbol{v} - \boldsymbol{w}\| < \epsilon\} = \{\boldsymbol{v}\}.$$

□