Let $M_{d \times d}(\mathbb{R})$ be the space of real $d \times d$ matrices. For $A = (a_{ij}) \in M^{dd}$, define

$$\|A\|_2 := \left(\sum_{i,j=1}^{d} |a_{ij}|^2 \right)^{\frac{1}{2}}$$

Show that

$$\|AB\|_2 \leq \|A\|_2 \|B\|_2$$