**Name:** _____

**1.** Define $\mathfrak{B}$ and $\mathfrak{B}^{\otimes n}$.

**Solution:** $\mathfrak{B}$ is a 2-dimensional $\mathbb{C}$-vector space with orthonormal basis $|0\rangle$ and $|1\rangle$,

$$\mathfrak{B} := \mathbb{C}\text{-span}\{|0\rangle, |1\rangle\}.$$

$\mathfrak{B}^{\otimes n}$ is the $n$th tensor power of $\mathfrak{B}$. It is a $2^n$-dimensional $\mathbb{C}$-vector space with orthonormal basis $|x\rangle$ for $x \in \{0,1\}^n$,

$$\mathfrak{B}^{\otimes n} := \underbrace{\mathfrak{B} \otimes \cdots \otimes \mathfrak{B}}_{n \text{ times}} = \mathbb{C}\text{-span}\left\{ |x\rangle \mid x \in \{0,1\}^n \right\}.$$