Quantum Algorithms: Quiz 9 2021-04-08

Name: _____

1. Let $\mathbb{A}$ be a subspace of the vector space $\mathbb{V}$ and let $|\alpha\rangle \in V$. Define Π_α and $\Pi_{\mathbb{A}}$.

Solution: We have

$$\Pi_\alpha = |\alpha\rangle \langle\alpha| .$$

For the second part, let $\mathcal{B} = \{e_1, \ldots, e_k\}$ be an orthonormal basis for $\mathbb{A}$ in $\mathbb{V}$. Then

$$\Pi_{\mathbb{A}} = \sum_{i=1}^{k} |e_i\rangle \langle e_i| = \sum_{i=1}^{k} \Pi_{e_i}.$$