

Exercises - Inner Product and Outer Product

Quantum Computing

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Exercise 1. Let

$$\hat{S} = |0\rangle\langle 0| + i|1\rangle\langle 1|$$

$$\hat{T} = |0\rangle\langle 0| + e^{i\frac{\pi}{4}}|1\rangle\langle 1|$$

$$|\psi\rangle = \frac{1+2i}{\sqrt{8}}|0\rangle - \sqrt{\frac{3}{8}}|1\rangle$$

$$|\phi\rangle = \frac{i}{\sqrt{5}}|0\rangle + \frac{2}{\sqrt{5}}|1\rangle$$

Compute the following:

1. $\langle\psi|\phi\rangle$
2. $\langle\phi|\psi\rangle$
3. $\hat{S}|\psi\rangle$
4. $\hat{T}|\psi\rangle$
5. $\hat{S}|\phi\rangle$
6. $\hat{T}|\phi\rangle$