

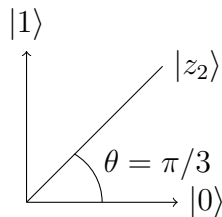
Hausübungen zur Vorlesung
Quantenalgorithmen
WS 2013/2014
Blatt 1 / 30 October, 2013

Exercise 1:

Measure the quantum states in the computational basis. What are the states after the measurement? Compute $\langle z_1 | z_2 \rangle$.

1. $|z_1\rangle = \left(\frac{1}{2} + \frac{1}{2}i\right)|0\rangle - \frac{1}{\sqrt{2}}|1\rangle$

2.



Exercise 2:

1. Show that the product of two unitary matrices is unitary;
2. Show that the columns of a unitary matrix form an orthonormal set.

Exercise 3:

Let $|z_0\rangle = |1\rangle$, $|z_1\rangle = \frac{i}{\sqrt{2}}|0\rangle + \frac{1}{\sqrt{2}}|1\rangle$. Find a linear transformation U , such that $|z_0\rangle = U|z_1\rangle$. How many such transformations can you find?

Exercise 4:

Show that the states $|z_0\rangle = -\frac{1}{\sqrt{2}}|0\rangle + \frac{\sqrt{3}i}{2}|1\rangle$ and $|z_1\rangle = -\frac{i}{\sqrt{2}}|0\rangle - \frac{\sqrt{3}}{2}|1\rangle$ are equivalent.