

Tutorial 6

21. 5. 2021

Task 1. Find normalized coordinates in \mathbb{C}^2 , polar coordinates, coordinates in \mathbb{R}^3 , and extended complex plane coordinates for qubits

- a) $(1, 0)$,
- b) $(0, 1)$,
- c) $(0, i)$,
- d) $\frac{1}{\sqrt{2}}(1, 1)$.

Task 2. Find density matrixes for vectors $|+\rangle$ and $|-\rangle$. Decompose them via Pauli matrices.

Task 3. Prove, that 2 vectors are orthonormal iff they correspond to the opposite points on the Bloch sphere.

Task 4. How do the Pauli matrices act on the Bloch sphere?

Task 5. Find a decomposition of CZ (controlled Z) gate, into one qubit gates and CNOTs. You can use the AXBXC decomposition.