Hints for homework 1

1. Basic Quantum Mechanics

- slides 11-23 from the lecture on 24.04.

2. Operator Functions 1

- spectral decomposition (slide 9)
- remember to normalize your eigenvectors

3. Operator Functions 2

- Method I: spectral decomposition
- Method II: taylor series

$$exp(x) = \sum_{n=0}^{\infty} \frac{x^n}{n!}$$

$$\cos(x) = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!}$$

$$\sin(x) = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!}$$

4. Single Qubit Quantum Circuits

- Example: the expectation value of Z in the state $|\psi\rangle$ is $\langle\psi|Z|\psi\rangle$

5. Controlled Not gate

- Tensor product (slides 7-8)