Week assignment 12 (Homework vault part)

Deadline: 22. 1. 2021

Upload scan, photograph, or a typesetted pdf of computation to the corresponding homework vault. Do not forget to include your name and personal ID number (učo) on the page(s).

Exercise 1. [1pt] Normalize vector $|\psi\rangle = |0\rangle - |-\rangle$.

Exercise 2. [2pts] We performed measurement of state $|\psi\rangle$ in the Bell basis 1000 times and found that the numbers of particular outcomes were

$$n_{\Phi^+} = 111, \quad n_{\Phi^-} = 97, \quad n_{\Psi^+} = 382, \quad n_{\Psi^-} = 410.$$

You know that the state $|\psi\rangle$ was one of the two states

$$|x\rangle = \frac{1}{\sqrt{5}}\left[-i\sqrt{2}\,|01\rangle + \sqrt{2}\,|10\rangle + i\,|11\rangle\right],$$
$$|y\rangle = \frac{1}{\sqrt{3}}\left[-i\,|01\rangle + \sqrt{2}\,|11\rangle\right].$$

Which one was most probably on the input? Explain your choice.

Exercise 3. [3pts] Let us have evolution described by unitary matrix

$$U = \frac{1}{2}\begin{pmatrix} 1 & \sqrt{2} & -1 \\ -\sqrt{2} & 0 & -\sqrt{2} \\ -1 & \sqrt{2} & 1 \end{pmatrix}.$$

Find stationary state of this evolution, i.e. such a state $|\mu\rangle$ that does not change under the action of U.