ETH
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Computational Quantum Physics
Exercise 13

FS 11
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Problem 13.1 Continuous time Quantum Monte Carlo

In this exercise, we will solve the $(0+1)d$ Ising model, given by the Hamiltonian

$$H = \Gamma \sigma_x \tag{1}$$

using a continuous-time cluster update Monte Carlo method as discussed in the lecture.

- Think about good data structures to implement the segments, kinks, etc. In C++, you might want to consider using a `set` to store the timeline.
- Be careful with correctly implementing the periodic boundary conditions.
- In the end, you should be able to reproduce the magnetization curve $\langle \sigma_x \rangle = \tanh \beta\Gamma$. You can calculate the magnetization in the Monte Carlo scheme as

$$\langle \sigma_x \rangle = \frac{\#\text{ of kinks}}{\beta\Gamma} \tag{2}$$