Exercise sheet 9 with Solutions

Reaction rates and barrier crossing

Theoretical Biophysics
Prof. Richard Neher – Biozentrum
Fall 2018

Exercise 9.1  Kramers rate

Simulate barrier crossing of diffusing particles across potential

\[ E(x)/kT = \beta e^{x-x_0} \]  

where \( x_0 \) is a Gaussian random variable. Repeat this until the particle escaped at \( x = 1 \). If the particle passes through the reflecting boundary, mirror the trajectory forward. Periodically report the position of the particle and finally compare the resulting distribution to the Boltzmann distribution.

Exercise 9.2  Dominant balance

Make up a polynomial equation of 5th order with at least 4 terms and find approximate solutions.