Homework 2

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October 6, 2022

Problem 1
Solution

(a) The dissipation term pulls the system back to the equilibrium. Since $\gamma^{-1} \ll t$, the region around x_0 must be thermalized enough. Since $t \ll \Gamma_{\text{esc}}^{-1}$, the particle doesn't have time to "explore" the $x > x_b$ region. So the $x < x_b$ region is described by the stationary equilibrium Maxwell–Boltzmann distribution, while the $x > x_b$ region isn't.

When $t \gg \Gamma_{\text{esc}}^{-1}$ the probabilistic distribution of the particle on the whole axis is described by the stationary equilibrium Maxwell–Boltzmann distribution. Since the global minimum is much lower than the local minimum at x_0, the particle is most likely to appear near the global minimum on the right of the barrier; there is still some possibility to find the particle near x_0.

(b) When