Final Project

1. Consider the harmonic oscillator

$$L = \frac{1}{2} m \dot{x}^2 - \frac{1}{2} m \omega^2 x^2$$

(a) Evaluate the ground state energy E_0 in Monte Carlo path integral

(b) Plot the ground state probability and compare with expected analytic form

(c) Calculate $\langle E(T) \rangle$ at finite temperature and compare with expected analytic form

(2a) and (2b) required for 242 only

2. Anharmonic double well potential

$$L = \frac{1}{2} m \dot{x} - a\left(x^2 - b^2\right)^2$$

(a) Evaluate the ground state energy E_0 in Monte Carlo path integral

(b) Plot the ground state probability

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bonus for 142: (a) and (b)

bonus for 142/242:

compare (a) and (b) with numerical solution from Schrödinger Eq.