Problem 7

Write a symbolic algebra program that performs a Metropolis Monte Carlo random walk to evaluate integrals of the type

\[ J = \int dx \, \rho(x) f(x) \]

where \( \rho \) is a normalized sampling function. Use your code to evaluate the integral

\[ J = \int dx \, e^{-x^2} x^4. \]

Report the results of your calculation for random walks of length \( 10^3 \), \( 10^5 \), \( 10^7 \) and compare to the analytical result.

Notice that the algorithm can be used for any number integration variables.