1. Write a function that transforms a uniform deviate into a Rayleigh distributed deviate described by

\[ p(y) \, dy = ye^{-y^2/2} \, dy, \quad y \geq 0. \]

Generate a suitable number of deviates and plot a normalized histogram to test your function (plot the expected Rayleigh distribution over your histogram for comparison).

2. The total mass \( M \) of an object of density \( \rho \) is given by

\[ M = \int V \rho \, dx \, dy \, dz, \]

where \( V \) represents the volume of the object. Using simple Monte Carlo integration, write a program that computes \( M \) and its estimated error \( \sigma_M \) if \( \rho = 1 + x^2 + 3(y + z)^2 \), where the volume of the object \( V \) is defined by \( x^2 + y^2 + z^2 \leq 9, \quad x \geq 0, \quad \text{and} \quad y \geq -1. \)

Plot \( M \) with errorbars \( \sigma_M \) as a function of the number of points \( N \) used in the Monte Carlo integration, for \( N \) between 10 and \( 10^7 \), in integer powers of 10.