CAP Part -II, Lab -3

Consider the function $f(x)=\frac{x^3}{e^x-1}$

1. Evaluate $\int_0^\infty f(x)dx$ using Monte Carlo method. Since the integral extends to infinity which can not be simulated, try different maximum values (x_{max}) to examine which one is sufficient.

(i) Generate 10^4 uniform random numbers between 0 and x_{max} and evaluate the integration over a sample size of 100, 500 and 10^4. (note: use a 19-20 digit integer number as SEED)

(ii) Make histograms (do not use python inbuilt list) of the integration values for sample size N= 100, 500 and check the $1/\sqrt{N}$ law for Monte Carlo integration.

(iii) What is the optimum value of x_{max}? Plot the histogram of x for the optimum x_{max}.