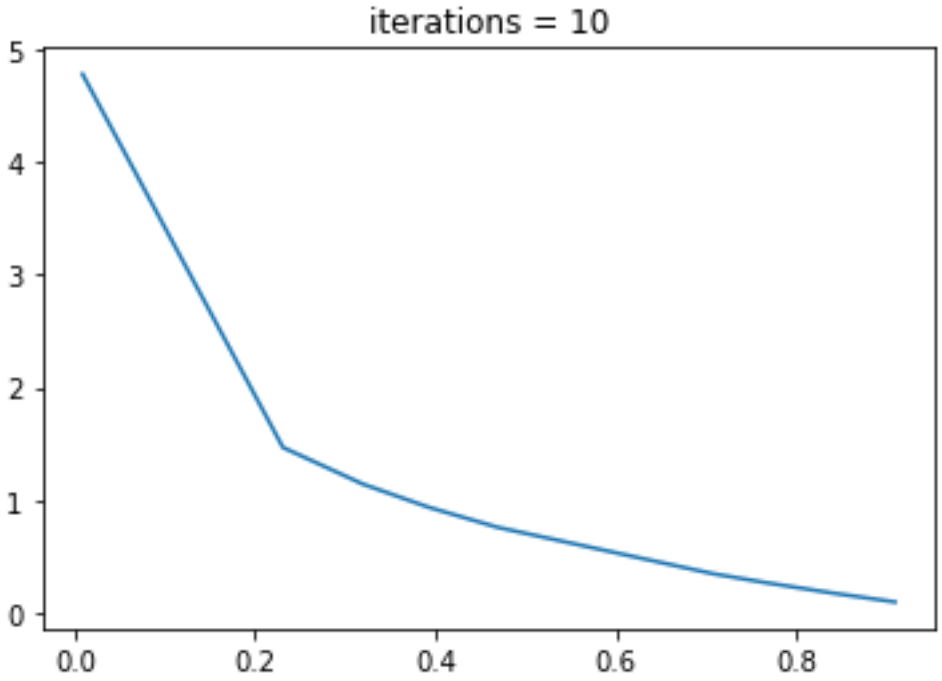
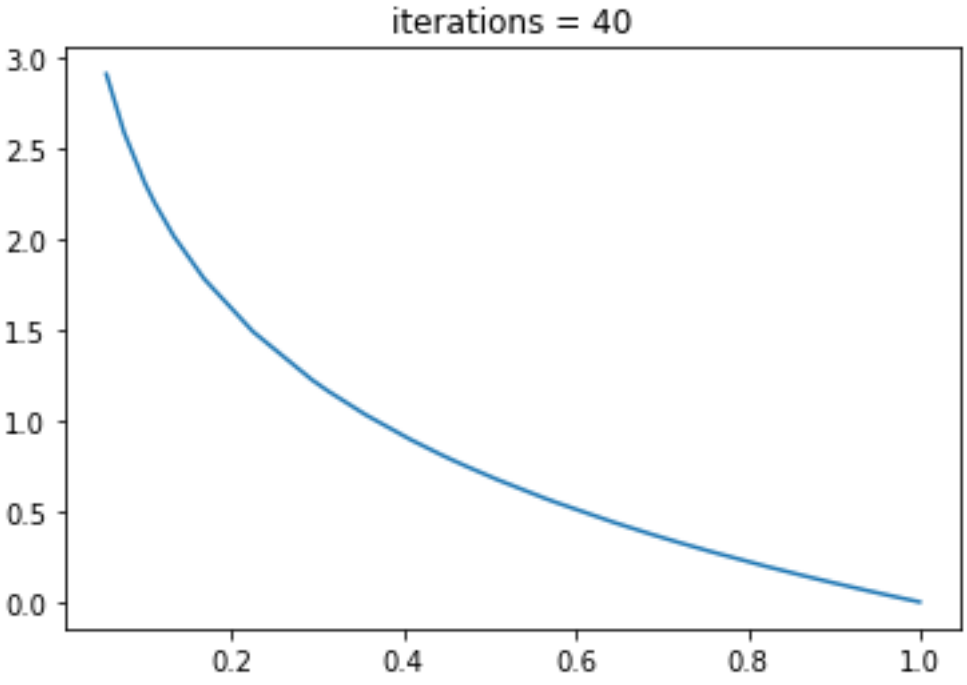
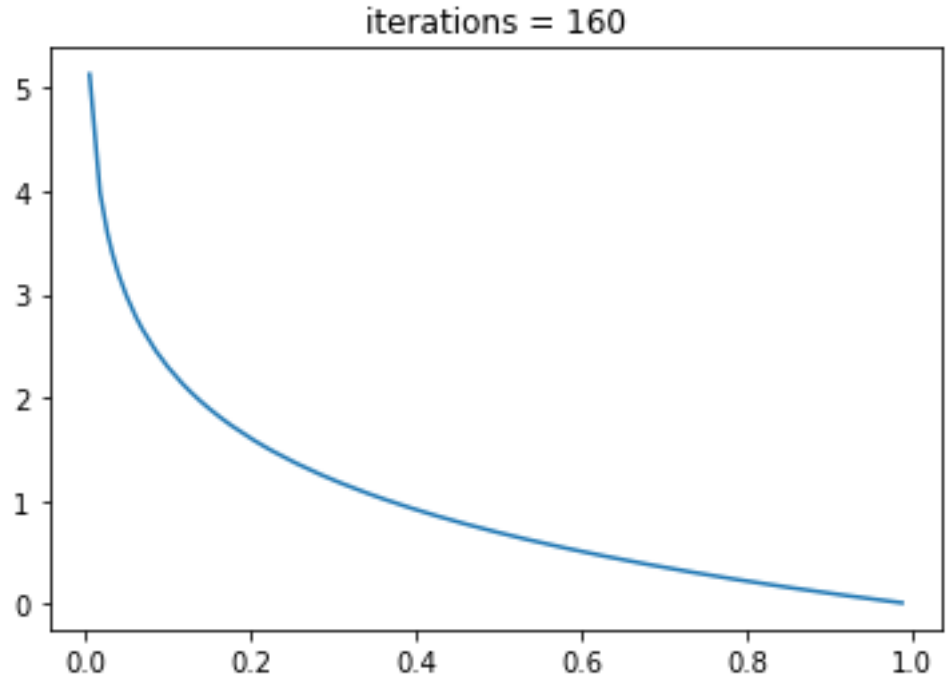
2. Write a Monte Carlo program (using a programming language of your choice) to sample the probability density function f(x) = exp(−x),x >0.
a. Estimate the mean and variance of f(x) using 10, 40, and 160 histories and compare the results to the values that you obtain analytically.
Analytical mean = 0.5
Analytical variance = 1/12 = 0.0833333
10 iterations
mean = 0.515894297515
variance = 0.0838033090832



40 iterations
mean = 0.592864194218
variance = 0.0874525751469



160 iterations
mean = 0.508781012246
variance = 0.08802999144



b. After running 100 or more batches of 100 histories each, make a histogram like the figure below for the distribution of the batch averages. Plot the Gaussian distribution that is predicted for the batch averages from the central limit theorem.