



Assignment 5

1 Monte Carlo Integration

- (15 Points) Some integrands are unbounded and yet their integrals exist. Evaluate the integrals

$$\int_0^1 \frac{dx}{\sqrt{x}}$$

and

$$\int_0^1 \frac{\sin(x)}{\sqrt{1-x}} dx,$$

using the Monte Carlo method. Estimate the accuracy of your results for different sample sizes.

2 Pseudorandom number generators with linear structures

- (15 Points) Crack, i.e., find (m, a, c, x_0) , the following sequence¹:
 – [61., 262., 151., 304., 785., 122., 427., 228., 613., 110., 831., 280., 569., 226., 339., 460., 653., 470., 999., 768.]
 Provide the code used.
- (20 Points) Together with this assignment you will find a sequence of 100.000 numbers (“Sequence.txt”) generated with the brand new PPP algorithm. Your task will be to test if the algorithm passes the χ^2 Test.

¹Hint: In “Marsaglia, G. (2003). Random number generators. Journal of Modern Applied Statistical Methods, 2(1), 2.”, Marsaglia describes an algorithm for identifying and cracking a PRNG based on a congruential generator. The attack determines the modulo m of the LCG by finding the greatest common divisor (GCD) of the volumes of parallelepipeds described by vectors taken from the LCG sequence. You may find that useful.