**FAST-NUCES Assignment # 3 Computer Modeling and Simulation**

Q. 1: In the class we have found out the value of pi using the Monte Carlo method. Using the same technique, you have to find the area under the curves for different functions. You have to enclose each curve in a rectangle. The dimensions of the rectangle can be easily determined from the values of x given and the values of y for that x using the given function. For reference, you can see the text book on how to find the area under a curve using the Monte Carlo Simulation. Write a program that uses Monte Carlo Simulation technique to find



1. the area between the curve for and the x-axis from x = 0 to x = 2



1. the area between the curve for and the x-axis from 0 to 1
2. An estimate of the volume of a sphere of radius 1 whose equation is x2 + y2 + z2 ≤ 1. Consider the portion of the sphere with x ≥ 0, y ≥ 0, and z ≥ 0; and multiply your result by 8. In the case of three dimensions, a point has three coordinates (x, y, z). Notice that Monte Carlo integration is useful for dimensions beyond two.



1. An estimate of . Note that the function is not entirely above or entirely below the x-axis, so we must adjust the algorithm in the text to estimate the integral. Recall that where a function is negative (below the x-axis), its integral is the negative of the area between the curve and the x-axis.

Provide the source files along with the results of the execution of the programs in the form of screenshots in a zipped folder.

Q.2: Consider a deck of 52 cards. Suppose the deck has been thoroughly shuffled. Write a program in any language of your choice that, using Monte Carlo Simulation, returns

1. the probability that at least two queens will appear next to each other in the shuffled deck.
2. the probability that at least one king and one queen appear next to each other or one card away in the shuffled deck. (Bonus marks for attempting this question)
3. In the Monte Carlo simulation, you have to repeat the experiment a certain number of times ‘n’. Plot the value of the probability you have determined in part a for different values of ‘n’ and discuss how the probability changes with increasing the value of ‘n’.