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MS QT

20246721

Solutions of Assignment 1.

Question1f.

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Now calculating average of the 10 random numbers
Average of 10 random numbers =   0.34542442335250551

Average of 100 random numbers =   0.48921157777704583

Average of 10,000 random numbers =   0.50318691766180534

Average of 10,00,000 random numbers =   0.49991277553307523
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Question 1g.

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Deviation in average from 0.5 for 10 numbers    0.15457557664749449
Deviation in average from 0.5 for 100 numbers    1.0788422222954175E-002
Deviation in average from 0.5 for 10,000 numbers    3.1869176618053441E-003
Deviation in average from 0.5 for 10,00,000 numbers    8.7224466924773481E-005
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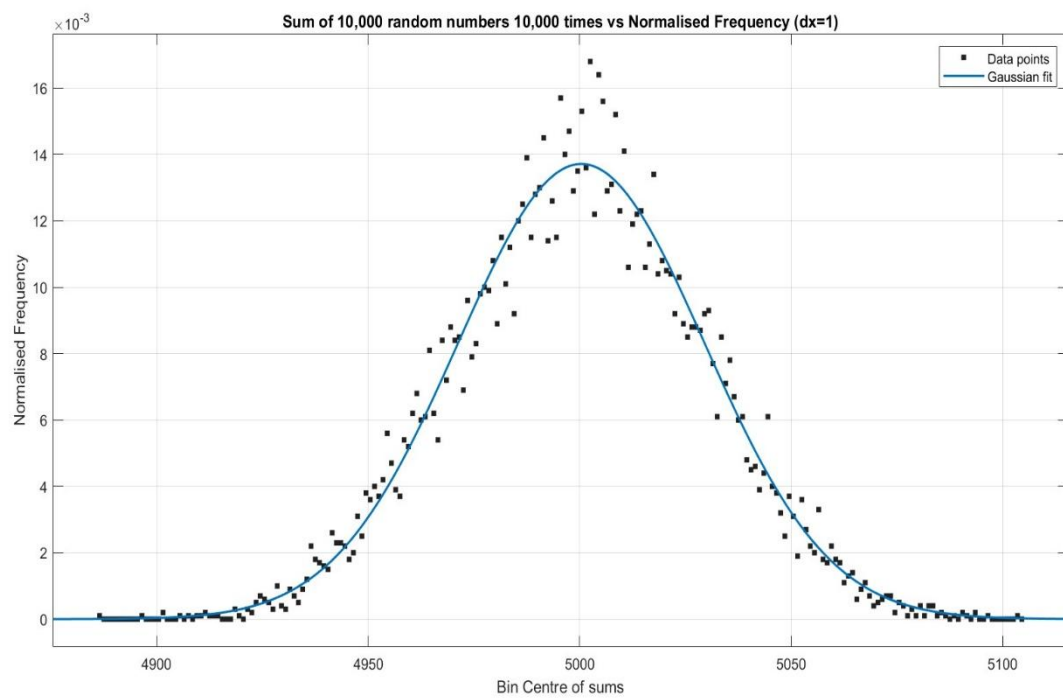
Question 1h.

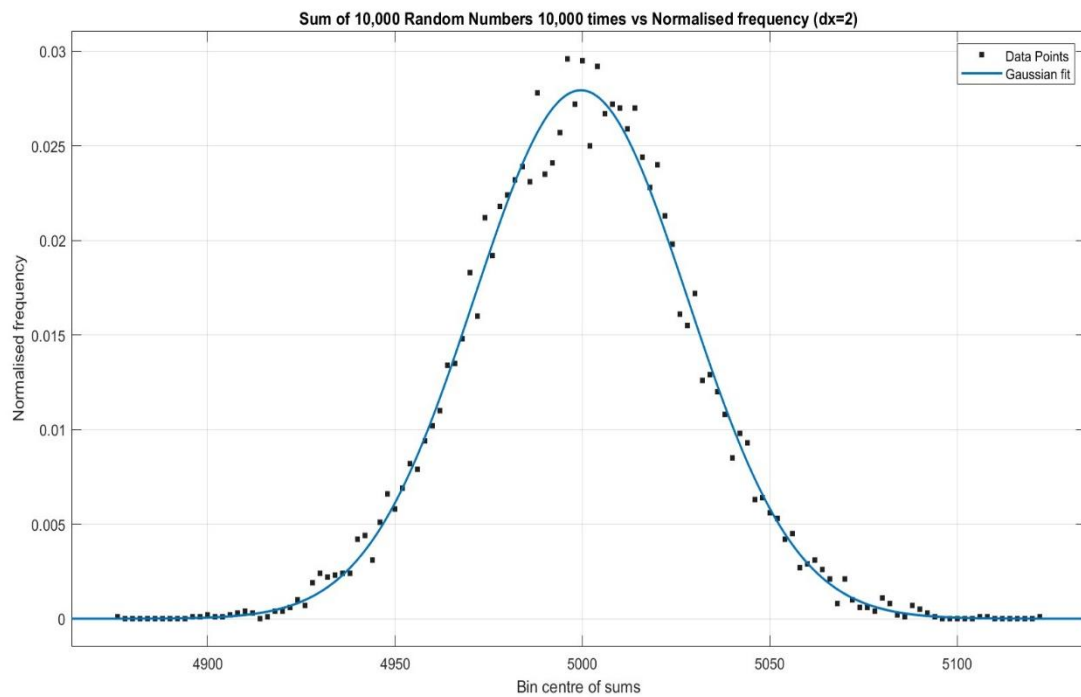Distribution for Sum (10,000 RN 10,000 times)

Sum of 10,000 random numbers 10,000 times v/s Frequency (bin size =1)
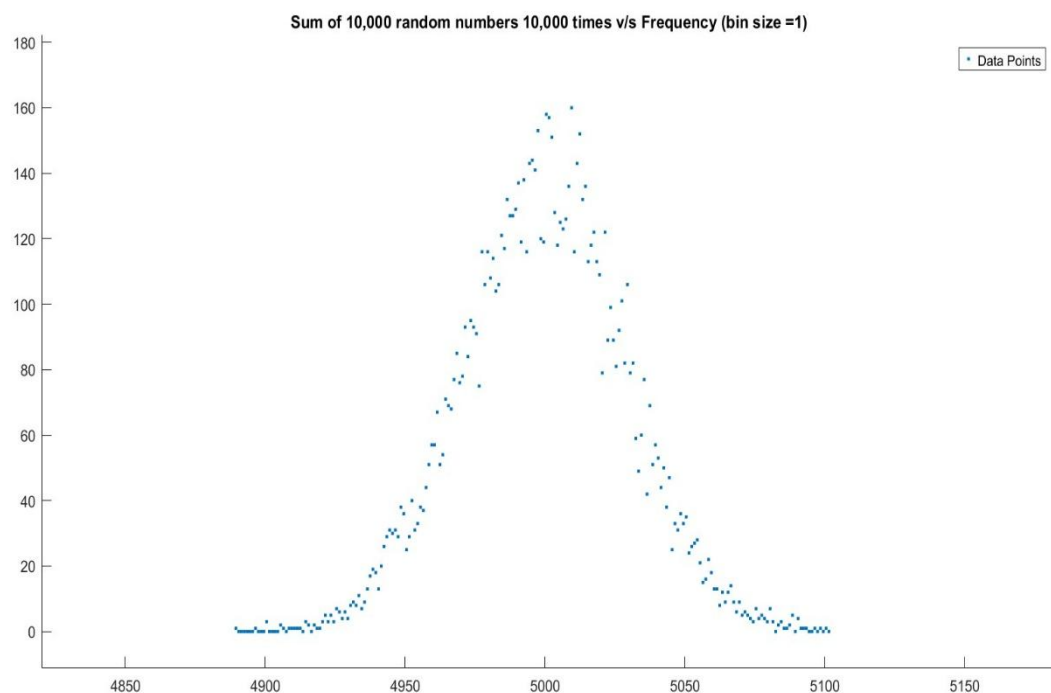
Normalised Distribution of sum for Bin size = 0.5
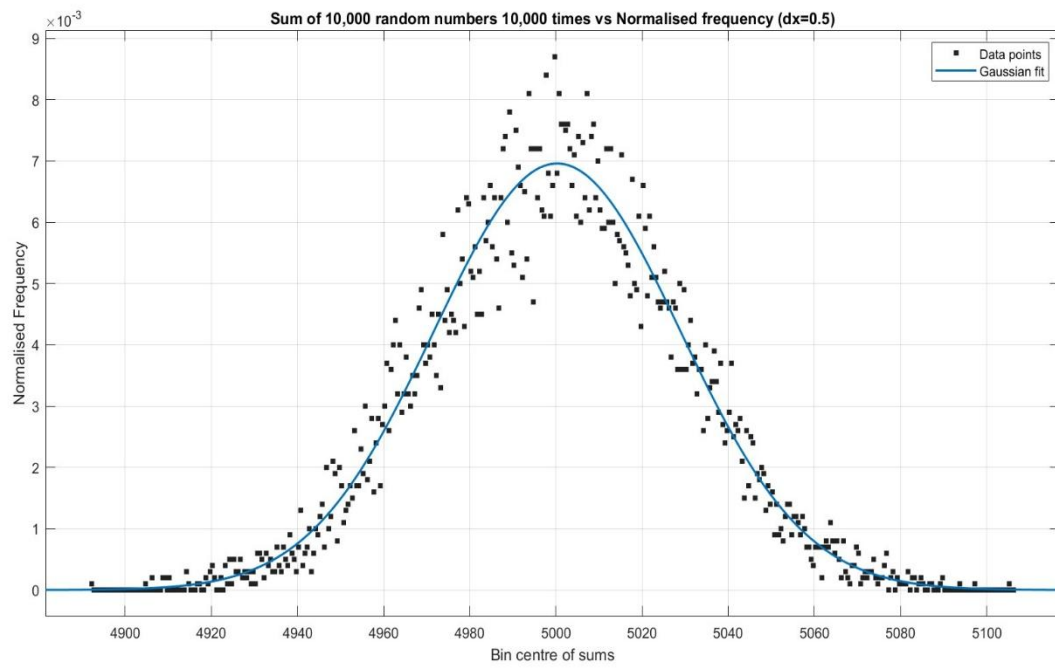
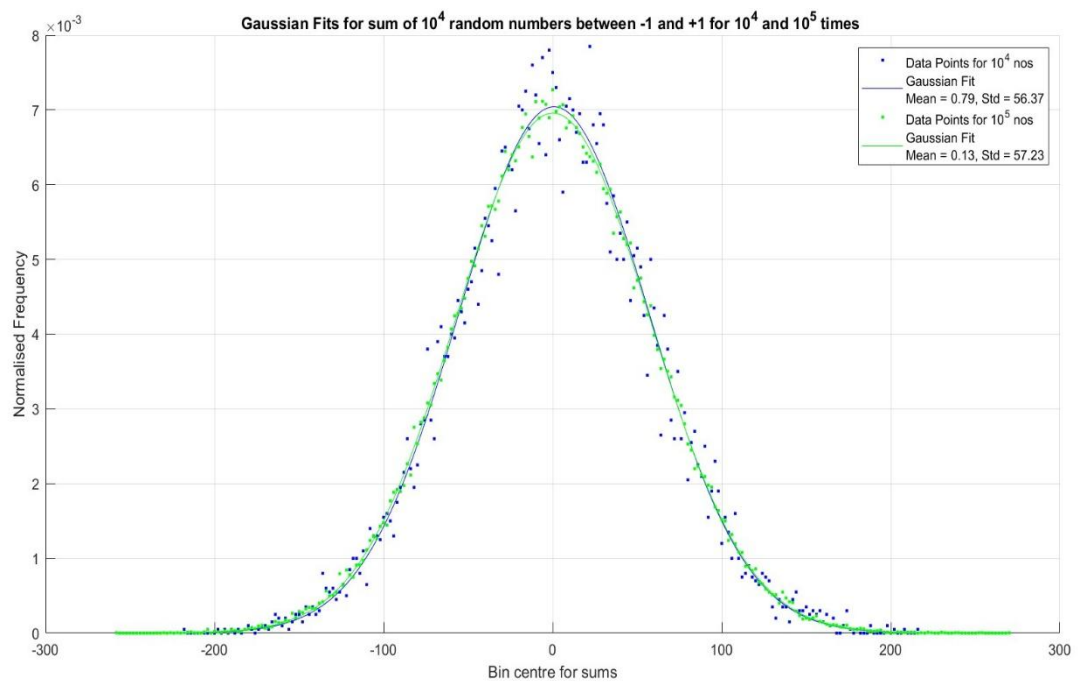

Normalised Distribution of sum for Bin size = 1

Normalised Distribution of sum for Bin size = 2

Sum of 10,000 Random Numbers 10,000 times vs Normalised frequency (dx=2)

Normalised distribution for sum of 10,000 random numbers between -1 and +1 taken 10,000 times and 100,000 times

Gaussian Fits for sum of 10^4 random numbers between -1 and +1 for 10^4 and 10^5 times
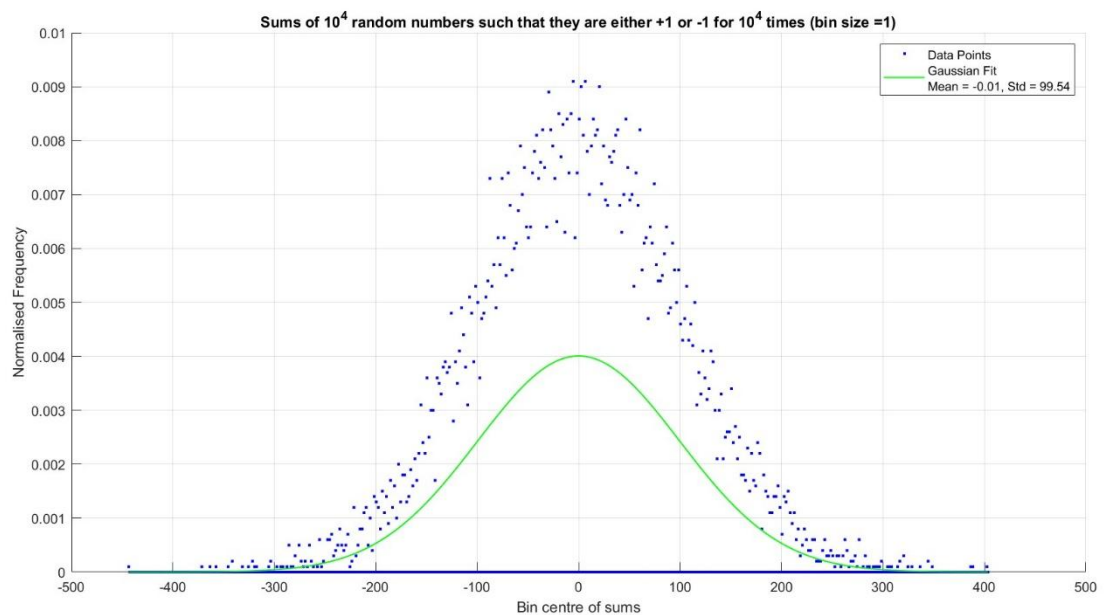
Variance for data when calculated 10^4 times = 3177.5769

Variance for data when calculated 10^5 times = 3275.2729

Question 1i.

Normalised distribution for sum of 10,000 random numbers as -1 or +1 taken 10,000 times with bin size = 1
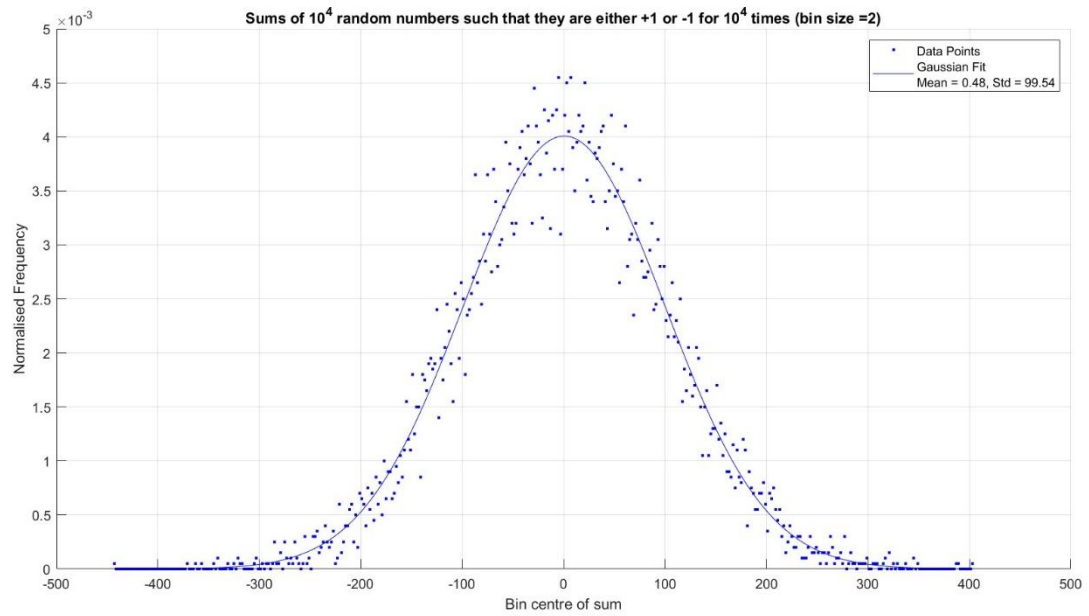

Variance = 9908.2116

Here the gaussian fit comes down due to presence of data points on the x axis having value zero. This zero value comes due to the fact that since we are taking sums even number of times, the total sum has to be even. Now the frequency is increased if sum is in the range

 Lower bin <= Sum < Upper bin (where bin size is 1)

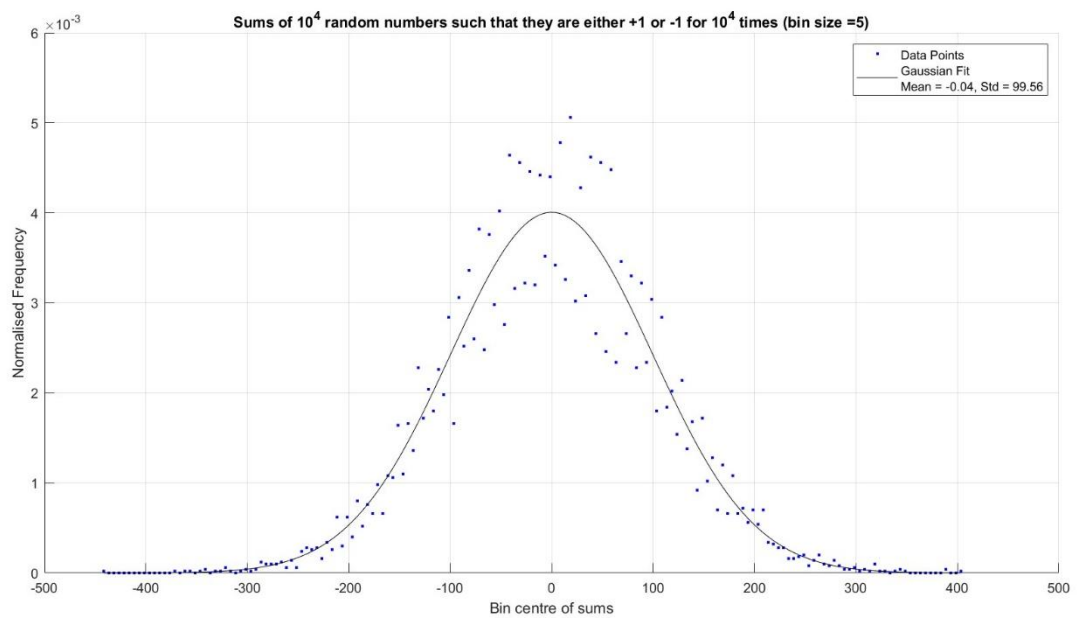Now odd bins are empty (as sums are even) therefore they have zero frequency.
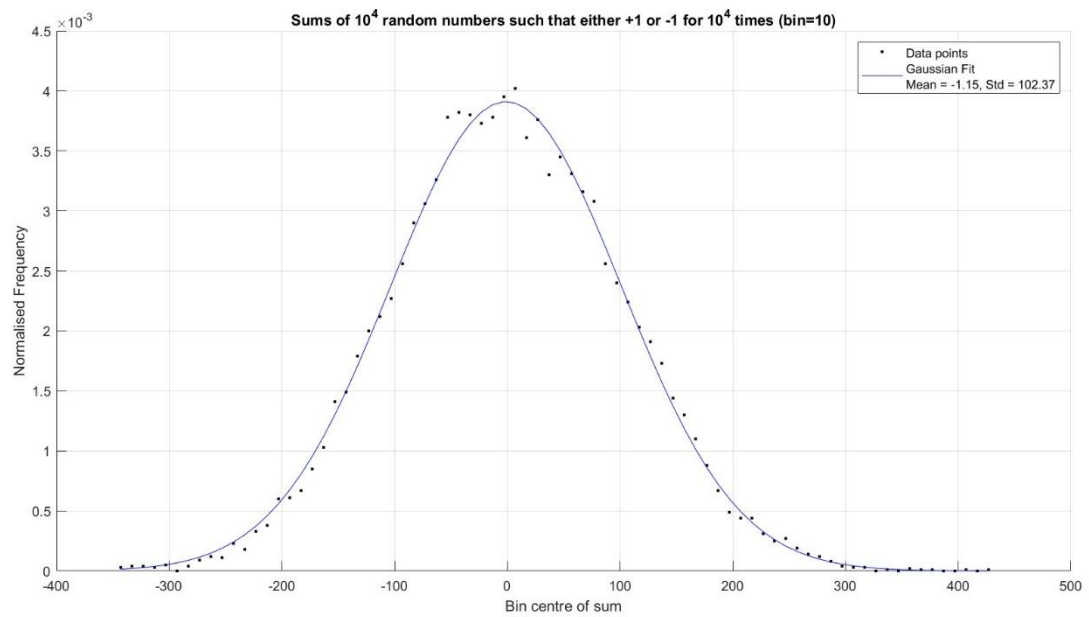
Question 1j

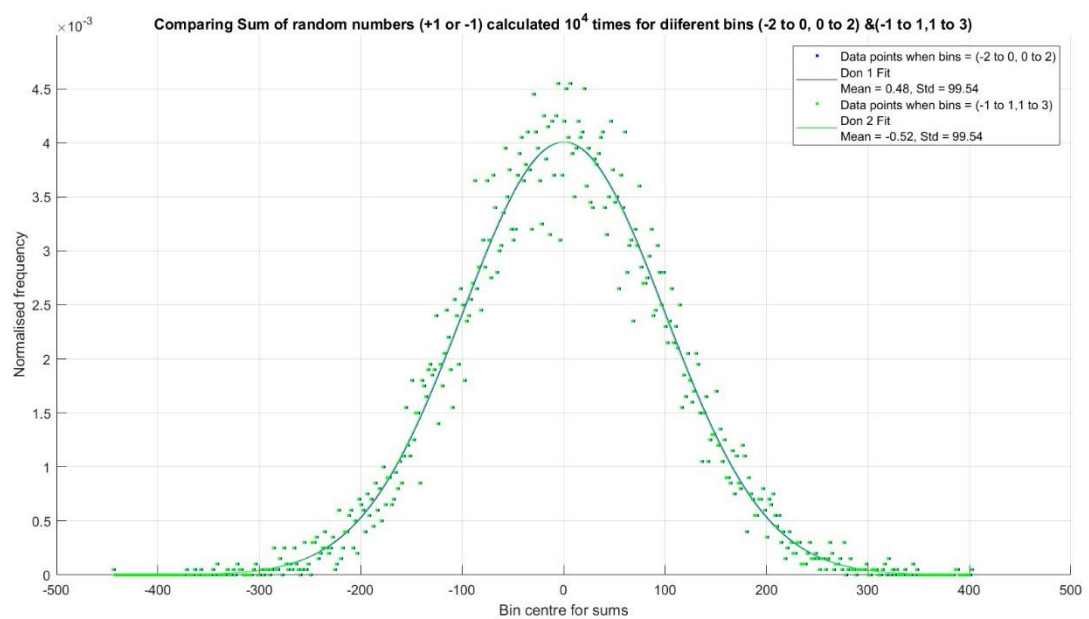Same Data as i but Width =2

Variance = 9908.2116

Width =5

Variance = 9912.1936

Width =10

Sums of 10^4 random numbers such that either +1 or -1 for 10^4 times (bin=10)

Variance = 10479.6169

Plotting data for 2 different bins (-2 to 0 ,0 to 2) and (-1 to 1, 1 to 3)

Comparing Sum of random numbers (+1 or -1) calculated 10^4 times for diiferent bins (-2 to 0, 0 to 2) &(-1 to 1,1 to 3)

Variance = 9908.2116

Magnified view of the data
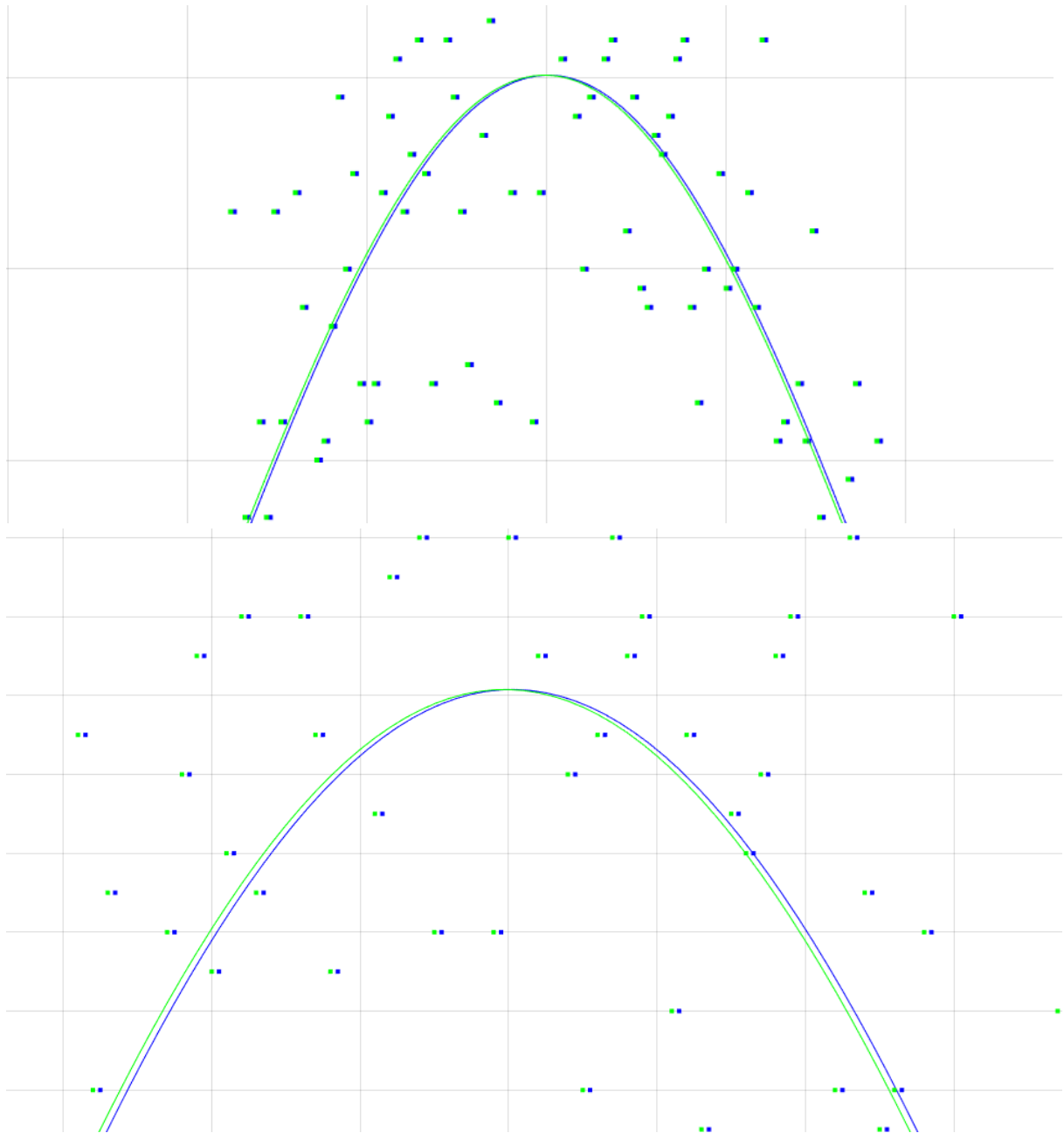
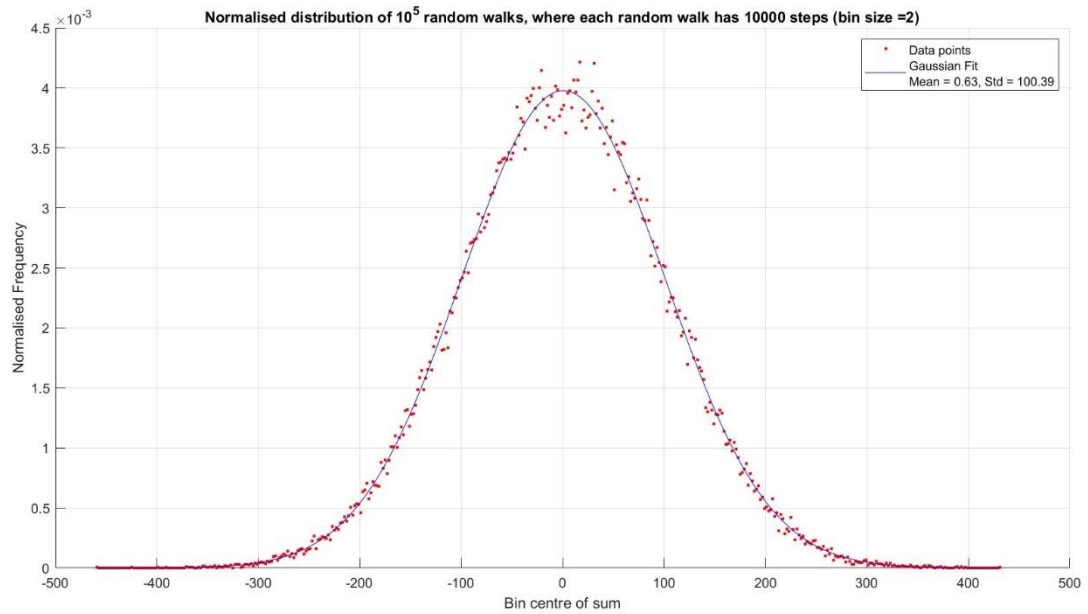The probability of finding the end of a random walk between x and x+dx :

It is given by the equation of the gaussian fit i.e

f(x) = exp(-((x-b)/c)^2)

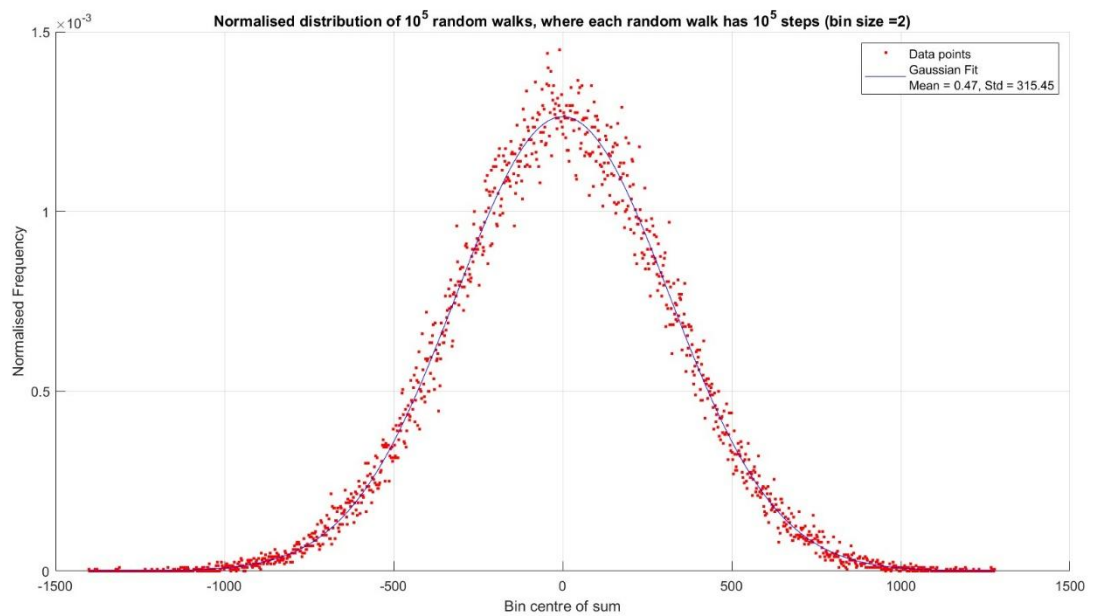where b = mean, c = standard deviation

Question 1k.

Distribution of 10^5 random walks, where each random walk has 10000 steps.

Variance = 10078.1521

Question 1l.

Normalized distribution of the sum for 10^5 random walks with 10^5 steps

Variance = 99508.7025