Assignment 4

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Code for all the question is in one ipynb file

**Question 1 (a)**

a) Using Box Muller Method:

i) For N = 100:

Mean = 0.014072

Variance = 1.086659

ii) For N = 10000:

Mean = 0.009768

Variance = 1.009137

b) Using Marsaglia and Bray Method:

i) For N = 100:

Mean = -0.096912

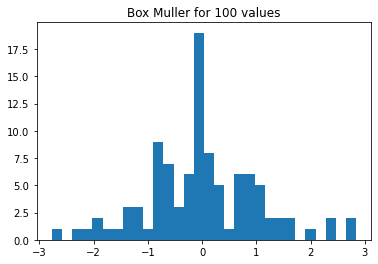
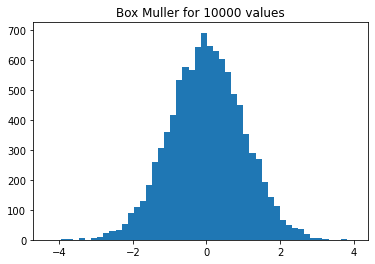
Variance = 1.049338

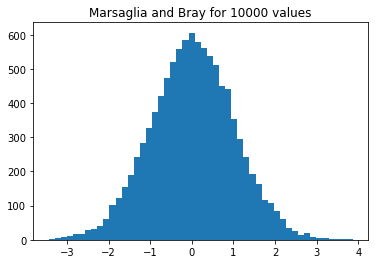
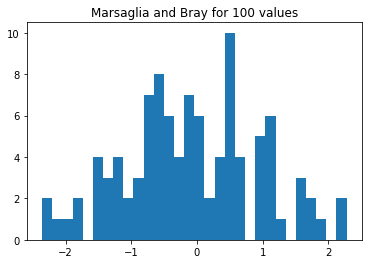
ii) For N = 10000:

Mean = 0.022152

Variance = 0.998991

**Question 1 (b)**

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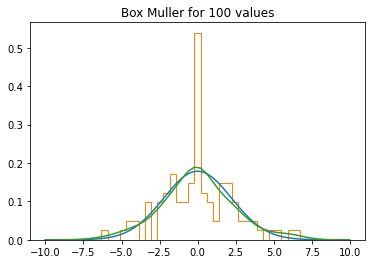
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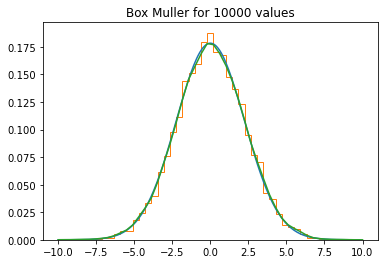
**Question 1 (c)**

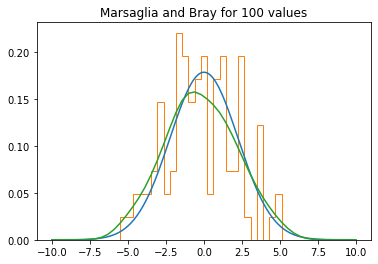
Curve in **blue** shows the PDF of normal distribution using formula

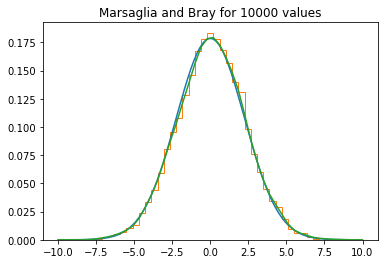
Curve in **green** show the approximate PDF using sample distribution histogram shown in orange colour.

**For N (0,5)**

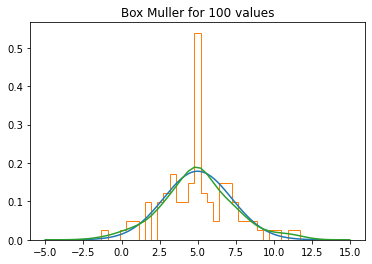


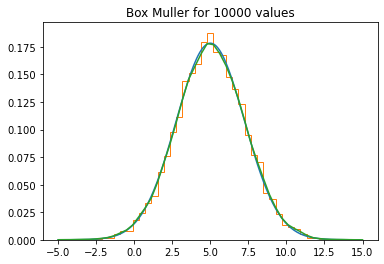


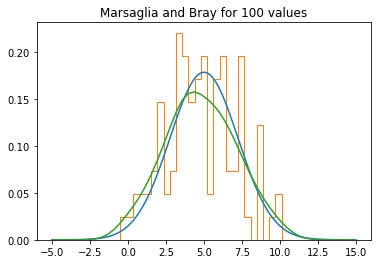


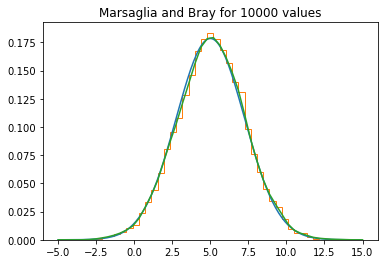


**For N (5,5)**









For N = 100 the graph doesn’t match well with the actual graph, but for N = 10000 it matches perfectly with the expected graph.

**Question 2:**

For N = 100:

Using Box-Muller – 997.0665 microseconds

Using Marsaglia and Bray – 999.9275 microseconds

For N = 10000:

Using Box-Muller – 46996.1166 microseconds

Using Marsaglia and Bray – 70993.4235 microseconds

Marsaglia and Bray takes more time than Box-Muller. Therefore, we can say that calculating sin, cos in Box-muller is a faster computation than using acceptance-rejection method in Marsaglia and Bray.

**Question 3:**

For N = 100, ratio is 0.26470588235

For N = 10000, ratio is 0.21764982005

The ratio for sample with 10000 values is very close to 1-π/4 = 0.214601836602