Data Analysis and Interpretation
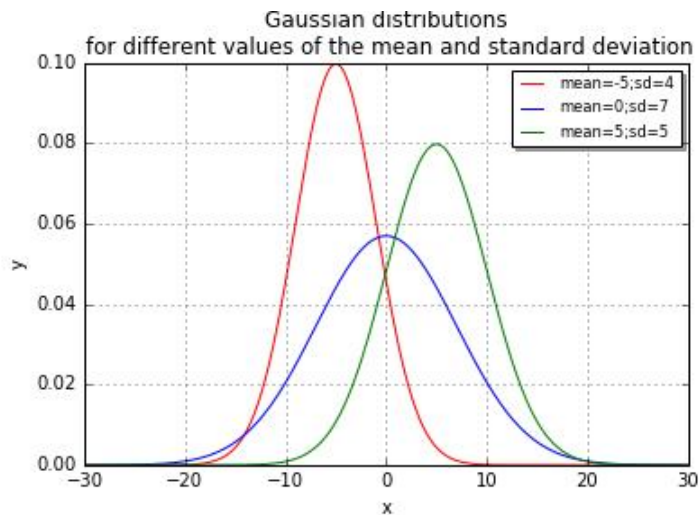# Assignment Solution 1

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1. Question 1

To plot a Gaussian distribution, Poisson distribution, Binomial distribution and to see what happens as the parameters are varied.

1.1 Plots of Gaussian Distribution Function

The Gaussian was plotted by taking different values for the mean and also the standard deviation. A graph was plotted taking the vaues as mentioned in the legend.
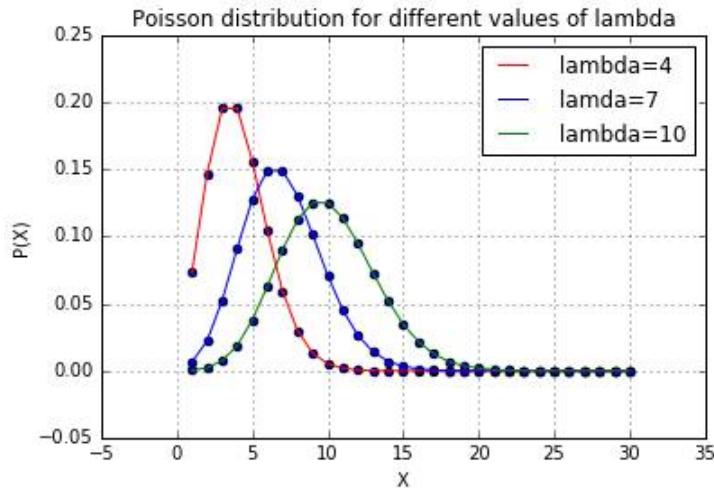
1.2 Plots of Binomial Distribution
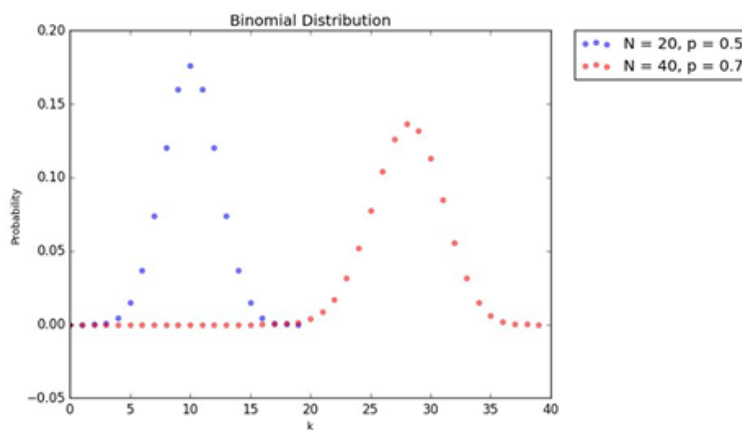
Due to the Binomial distribution being a discrete distribution a scatter plot is plotted. In this The value of N and the probability is changed and change in the nature of the graph

is noted. The graph plotted shows the binomial distribution for a few specific values of N and p.

1.3 Plots of Poisson Distribution

Poisson distribution for different values of lambda

Similar to the Binomial distribution with the product $N \times p$ equal to λ the Poisson distribution is ploted and studied on varying the values of the parameter λ. A scatter plot has been plotted for a few specific values of ths parameter.

2. Question 2

1. To write a program that can generate 2000 randomly distributed random numbers in a square and by seeing how many of these lie inside a circle.
2. To use this to estimate the value of pi a find the error on the estimate.
3. To repeat the above experiment 500 times and plot the distribution of mean values of pi obtained.

2.1 Plot of distribution of pi

Sample mean of value of π = 3.141944
Standard Deviation of value of π = 0.0355437602652
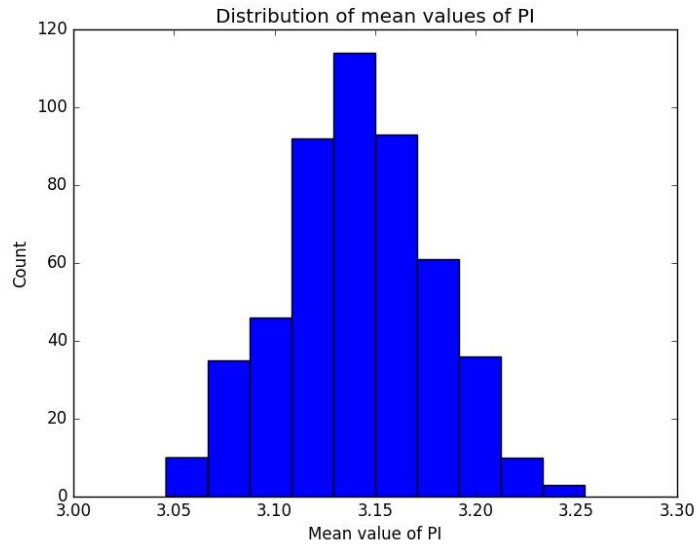
The Monte Carlo method (by using 2000 random numbers) for the estimation of the value of π was repeated 500 times and the mean value was plotted in the form of a histogram.

The error for each individual experiment is estimated by $|\text{mean-}\pi|$ and printed.

For the 500 repeated experiments the mean has been calculated and printed. The error in the value of π is measured by first calculating the sample width and then estimating the stanard deviation of the the value of π.

These values of the mean and the standard deviation are mentioned above.

3. Summary

For the week 19.09.16 to 28.09.16, we were assigned the task of familiarising ourselves with the basics of python and LaTeX. For this task we made various plots of the Gaussian, Binomial, and Poisson distributions.
The second part of the assignment was an introduction to Monte-Carlo methods, where we attempted to estimate value of pi through computer simulations.

4. Roles for this week 1

The work distribution for the week was as follows:
1. Team Leader: Amey Gaikwad
2. Programmers: Amey Gaikwad, Guru Vamsi, Rahul Dandwate
3. Report Compilation and Website setup: Sumukh Vaidya