CENG 114
Probability and Statistics
HOMEWORK 1
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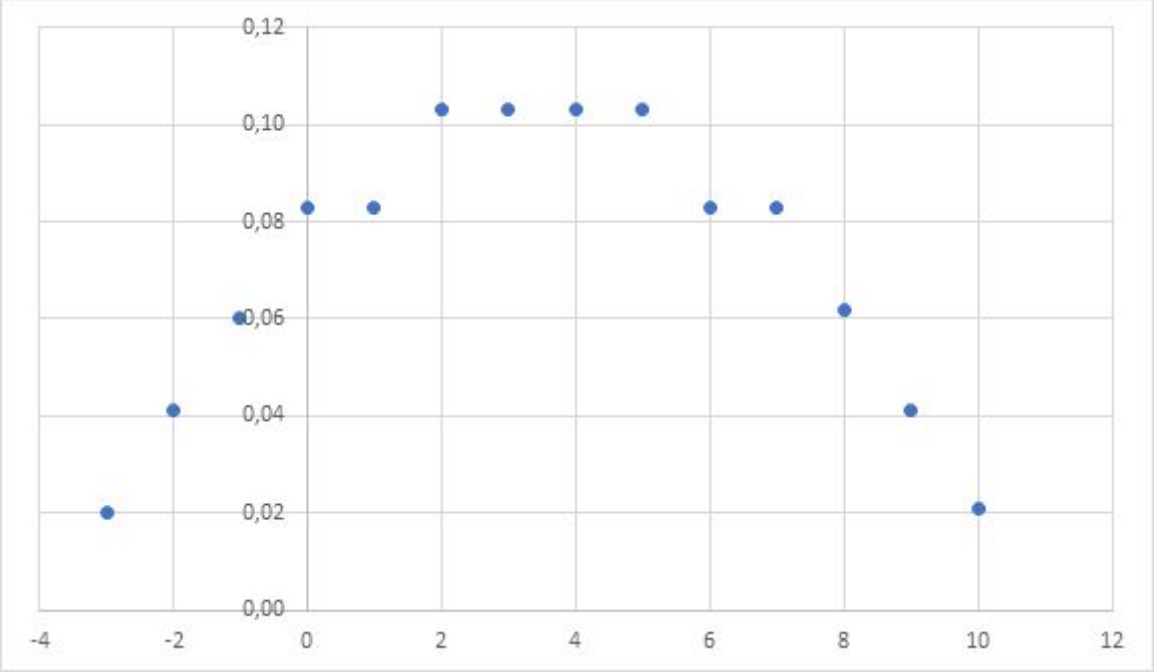
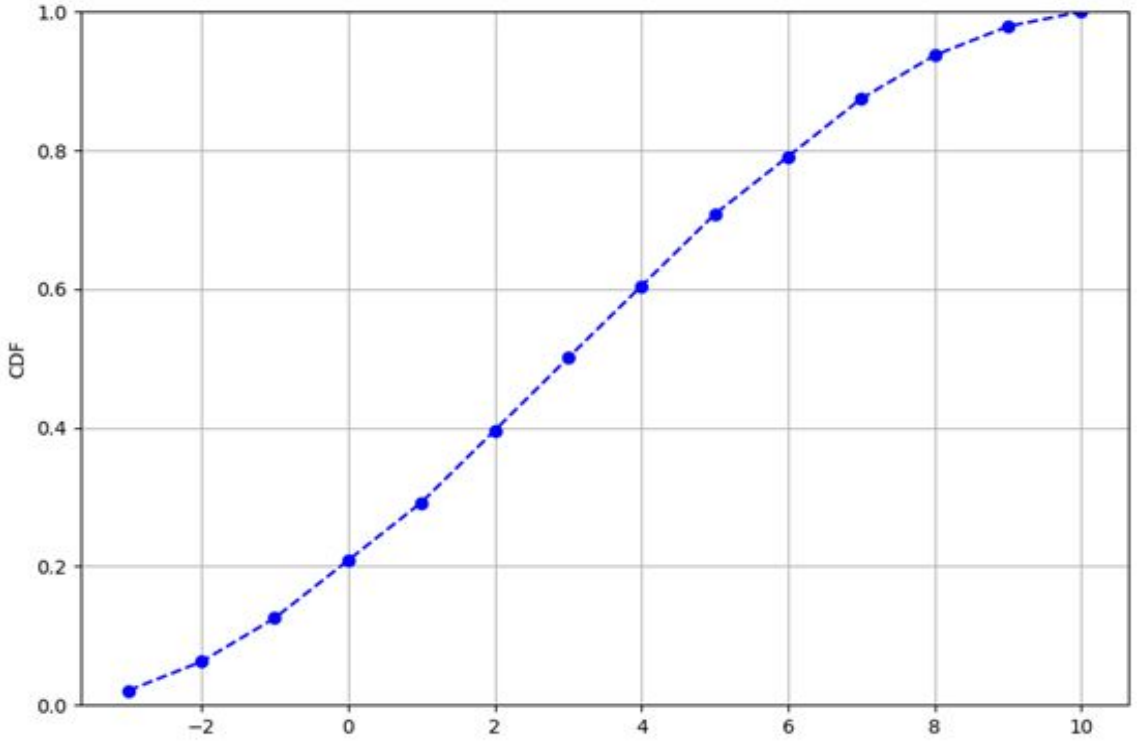
Probability Mass Function of X

[-3: 0.020, -2: 0.041, -1: 0.062, 0: 0.083, 1: 0.083, 2: 0.103, 3: 0.103, 4: 0.103, 5: 0.103, 6: 0.083, 7: 0.083, 8: 0.062, 9: 0.041, 10: 0.020]



Cumulative Distribution Function of X

[-3: 0.020, -2: 0.062, -1: 0.125, 0: 0.208, 1: 0.292, 2: 0.396,
3: 0.500, 4: 0.604, 5: 0.707, 6: 0.791, 7: 0.874, 8: 0.937, 9: 0.978,
10: 1]



Sample of X is :

{-3,-2,-2,-1,-1,-1,0,0,0,0,1,1,1,1,2,2,2,2,2,3,3,3,3,3,4,4,4,4,4,5,5,5,5,5,6,6,6,6,7,7,7,7,8,8,8,9,9,10}

Calculating Expected Value

(1*-3)/48 + (2*-2)/48 + (3*-1)/48 + (4*0)/48 + (4*1)/48 + (5*2)/48 + (5*3)/48 + (5*4)/48 + (5*5)/48 + (4*6) /48 + (4*7)/48 + (3*8) /48 + (2*9)/48 + (1*10)/48 = 3,5

3,5 is expected value of X

Calculating Variance

$$s^2 = \frac{\sum (X - \overline{X})^2}{N - 1}$$

I applied this formula to sample to calculate the variance of X.

10.416666666667 is variance of X

Comparison to Simulation

Distribution of X in the histogram from simulation matches with the graph of probability mass function of X that I calculated. Average values and variance from simulations are very close to the calculated values. The values from simulation didn't deviate more than 0.02 compared to calculated values.