Monte Carlo Simulations (MA323) Lab 6

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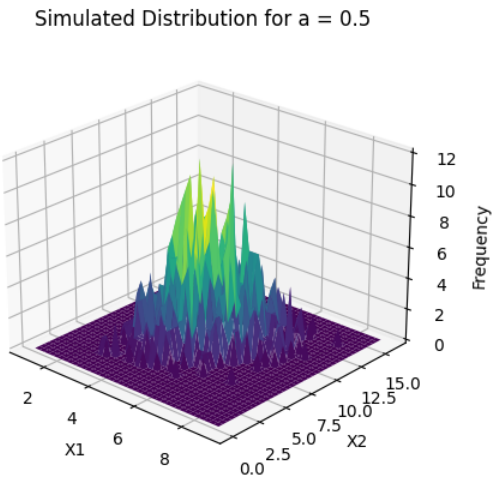
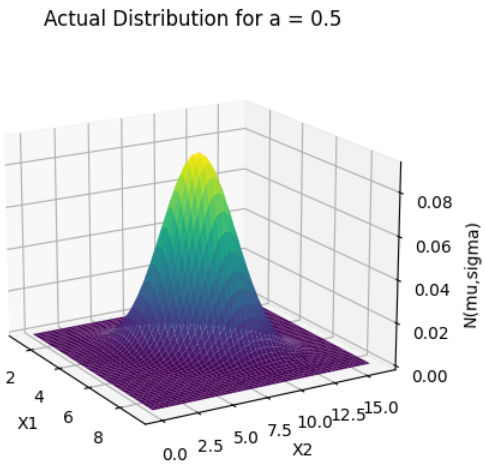
Question 1

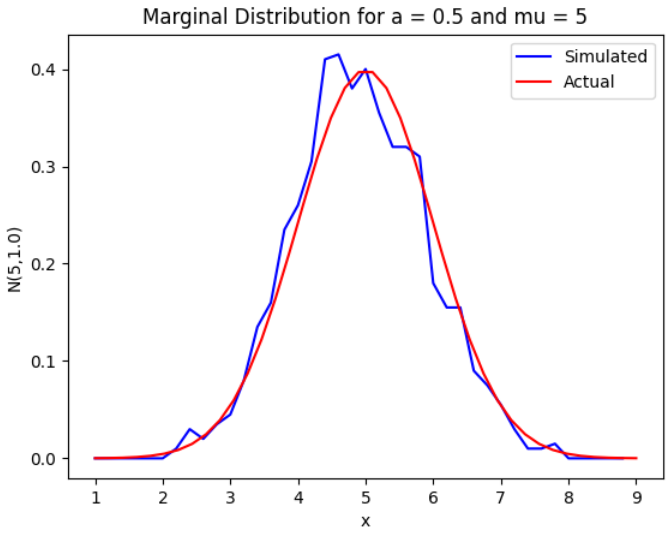
First Z_1 and Z_2 are generated such that Z_1, Z_2 ~ N(0,1) (Univariate Normal Distribution). Then the matrix A satisfying $AA^T = \mathbf{\Sigma}$ is calculated using Cholesky Factorization, and the transformation $X = \mu + AZ$ is applied to generate the random variable X which follows the distribution $X \sim N(\mu, \mathbf{\Sigma})$.

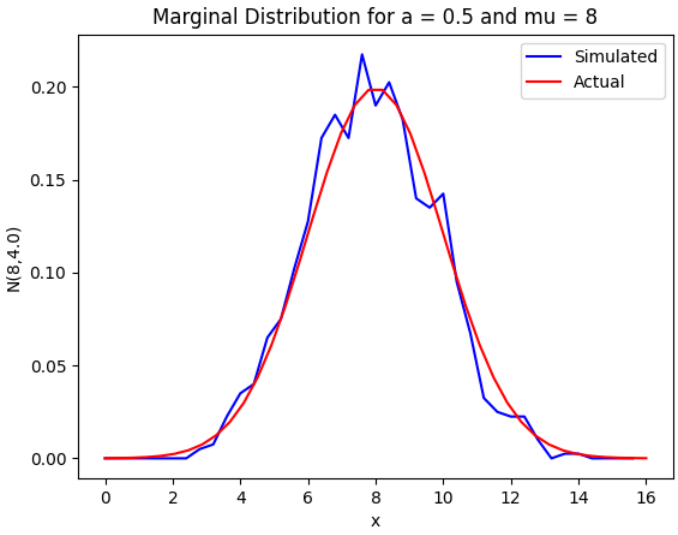
Question 2 and 3

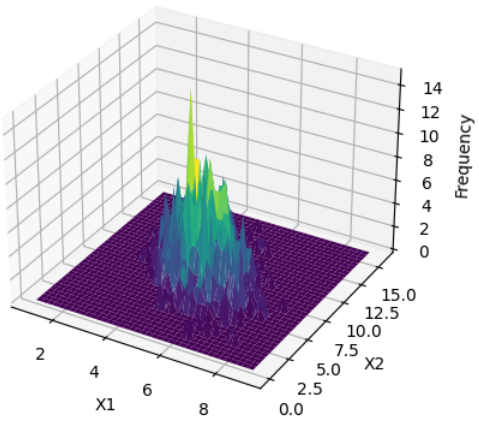
For the case a = 1, the Variance-Covariance matrix becomes singular (determinant = 0), Hence the Normal Distribution doesn't exist. So in order to get an approximate plot the value of a is changed slightly **only for the actual distribution**. The graphs generated are -

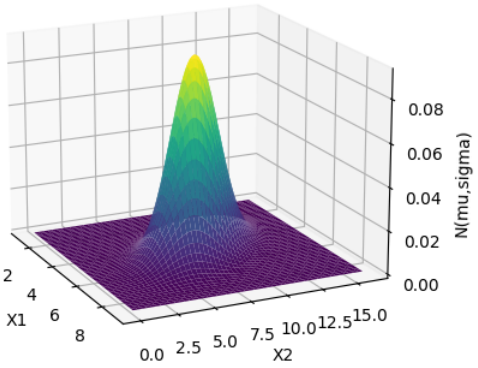


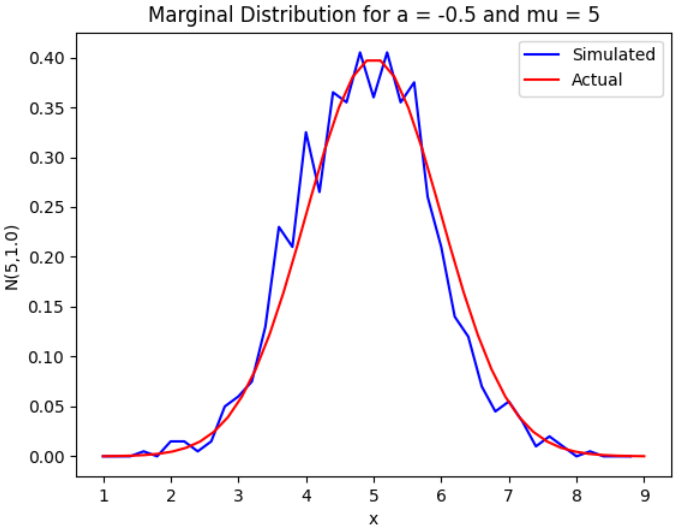


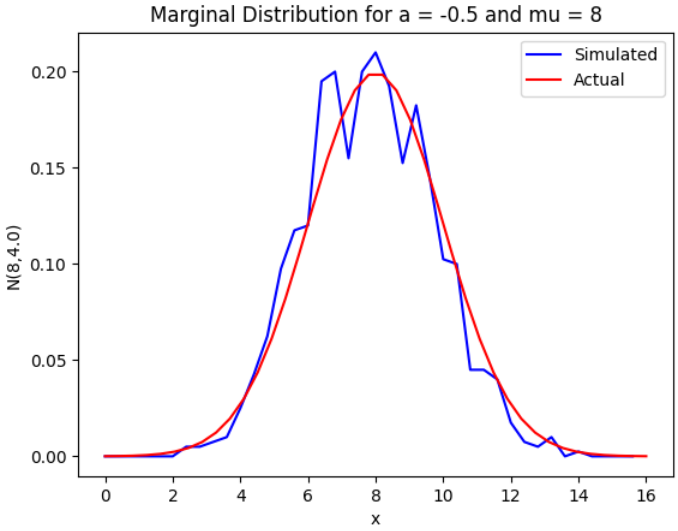

Marginal Distribution for a = 0.5 and mu = 5
Simulated
Actual
N(5,1.0)
x

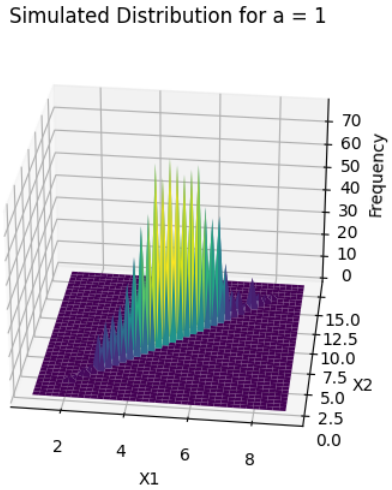

Marginal Distribution for a = 0.5 and mu = 8
Simulated
Actual
N(8,4.0)
x

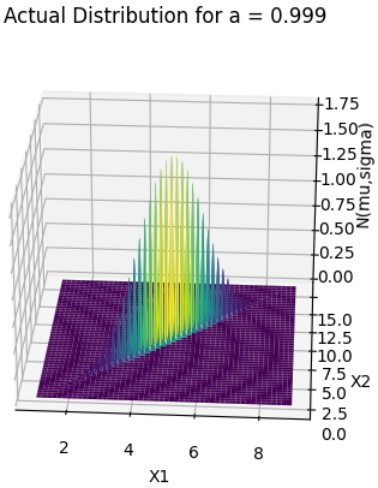

Simulated Distribution for a = -0.5
Frequency
X1
X2

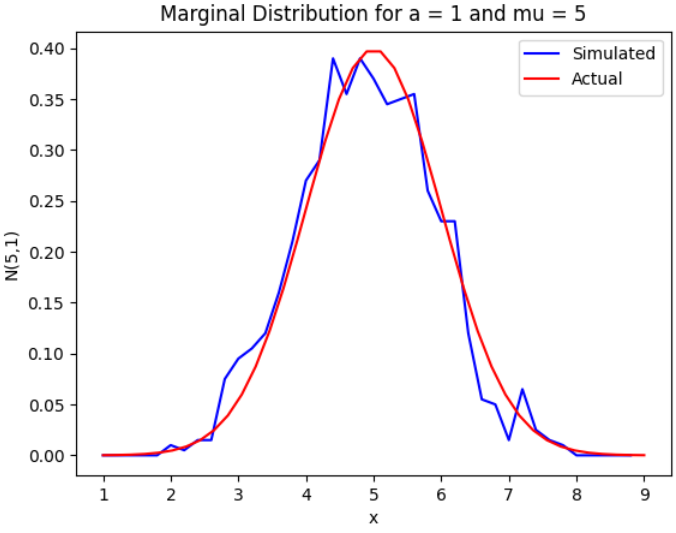

Actual Distribution for a = -0.5
N(mu,sigma)
X1
X2

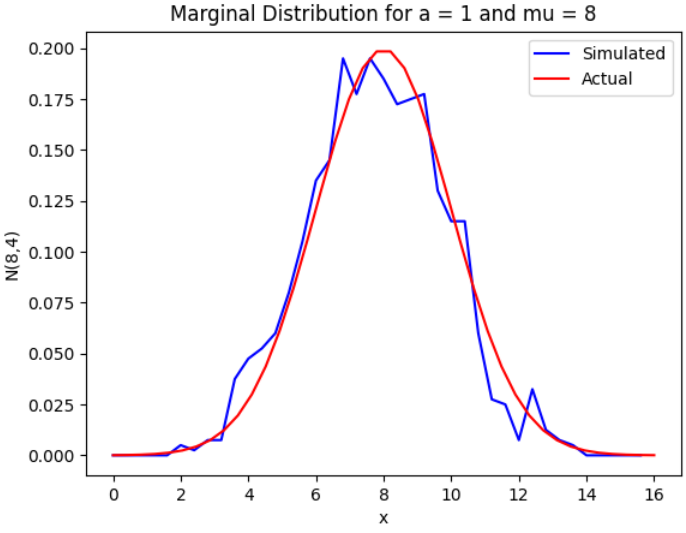

Marginal Distribution for a = -0.5 and mu = 5
Simulated
Actual
N(5,1.0)
x


Marginal Distribution for a = -0.5 and mu = 8
Simulated
Actual
N(8,4.0)
x


Simulated Distribution for a = 1
Frequency
X1
X2


Actual Distribution for a = 0.999
N(mu,sigma)
X1
X2


Marginal Distribution for a = 1 and mu = 5
Simulated
Actual
N(5,1)
x


Marginal Distribution for a = 1 and mu = 8
Simulated
Actual
N(8,4)
x