# Statistics Software Lab Report - 5 (Outputs file)

Name of the Student: Shatansh Patnaik
Roll No: 20MA20067

IIT Kharagpur
Statistics Software Lab

## Output for Exercise-1

Given:
$$\boldsymbol{\mu}^T = \begin{pmatrix} 1 & -1 & 2 \end{pmatrix}$$

and
$$\boldsymbol{\Sigma} = \begin{pmatrix} 4 & 2 & 2 \\ 2 & 4 & 2 \\ 2 & 2 & 4 \end{pmatrix}$$

```
> ##############################################################
Exercise 1
> meanVector <- matrix(c(1, -1, 2), nrow=3, ncol=1)
> covarianceVector <- matrix(c(4, 2, 2, 2, 4, 2, 2, 2, 4), nrow=3, ncol=3)
> printSolutionForExercise(meanVector, covarianceVector)
Sample Mean: 0.9470797 -1.021345 2.005817
Sample Covariance Matrix: 6.102804 2.340203 1.675837 2.340203 3.372274
    0.9812086 1.675837 0.9812086 2.677009
Mean Norm Error: 0.05735842
Covariance Matrix Norm Error: 3.013908
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```

## Output for Exercise-2

Given:
$$\boldsymbol{\mu}^T = \begin{pmatrix} 1 & 1 & 1 \end{pmatrix}$$

and
$$\boldsymbol{\Sigma} = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}$$

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> ##############################################################
Exercise 2
> meanVector <- matrix(c(1, 1, 1), nrow=3, ncol=1)
> covarianceVector <- matrix(c(2, -1, 0, -1, 2, -1, 0, -1, 2), nrow=3, ncol
    =3)
> printSolutionForExercise(meanVector, covarianceVector)
Sample Mean: 0.9787008 1.025701 0.9838935
Sample Covariance Matrix: 2.536454 -0.9332351 -0.0051373 -0.9332351 2.241416
    -0.9495311 -0.0051373 -0.9495311 1.317643
Mean Norm Error: 0.03706237
Covariance Matrix Norm Error: 0.9087014
> ##############################################################
```

## Output for Exercise-3

Given:

$$\boldsymbol{\mu} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

and

$$\boldsymbol{\Sigma} = \begin{pmatrix} 1 & -2 & 0 \\ -2 & 5 & 0 \\ 0 & 0 & 2 \end{pmatrix}$$

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> ######################################################################
Exercise 3
> meanVector <- matrix(c(0, 0, 0), nrow=3, ncol=1)
> covarianceVector <- matrix(c(1, -2, 0, -2, 5, 0, 0, 0, 2), nrow=3, ncol=3)
> printSolutionForExercise(meanVector, covarianceVector)
Sample Mean: -0.02884004 0.004223607 -0.02555789
Sample Covariance Matrix: 4.896164 -1.961918 0.02476473 -1.961918 0.9881888
    -0.005022494 0.02476473 -0.005022494 1.96725
Mean Norm Error: 0.03876587
Covariance Matrix Norm Error: 5.59285
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## Output for Exercise-4

Given:

$$\boldsymbol{\mu}^T = \begin{pmatrix} 4 & 3 & 2 & 1 \end{pmatrix}$$

and

$$\boldsymbol{\Sigma} = \begin{pmatrix} 3 & 0 & 2 & 2 \\ 0 & 1 & 1 & 0 \\ 2 & 1 & 9 & -2 \\ 2 & 0 & -2 & 4 \end{pmatrix}$$

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> ######################################################################
Exercise 4
> meanVector <- matrix(c(4, 3, 2, 1), nrow=4, ncol=1)
> covarianceVector <- matrix(c(3, 0, 2, 2, 0, 1, 1, 0, 2, 1, 9, -2, 2, 0,
    -2, 4), nrow=4, ncol=4)
> printSolutionForExercise(meanVector, covarianceVector)
Sample Mean: 4.078464 3.033013 2.049293 1.006356
Sample Covariance Matrix: 5.520235 1.060205 1.431775 1.130948 1.060205
    1.975105 2.608144 -0.02856535 1.431775 2.608144 8.629232 -1.358149
    1.130948 -0.02856535 -1.358149 1.005175
Mean Norm Error: 0.0985734
Covariance Matrix Norm Error: 5.177936
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## Output for Exercise-5

Given:

$$\boldsymbol{\mu}^T = \begin{pmatrix} 2 & 4 & -1 & 3 & 0 \end{pmatrix}$$

and

$$\boldsymbol{\Sigma} = \begin{pmatrix} 4 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 & 0 \\ -1 & 1 & 2 & -1 & 0 \\ 2 & 1 & 0 & 3 & -1 \\ -1 & 0 & 0 & -1 & 4 \end{pmatrix}$$

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Exercise 5
> meanVector <- matrix(c(2, 4, -1, 3, 0), nrow=5, ncol=1)
> covarianceVector <- matrix(c(4, -1, 0.5, -0.5, 0, -1, 3, 1, -1, 0, 0.5, 1,
    6, 1, -1, -0.5, -1, 1, 4, 0, 0, 0, -1, 0, 2), nrow=5, ncol=5)
> printSolutionForExercise(meanVector, covarianceVector)
Sample Mean: 2.027979 3.961159 -0.9679693 3.016292 0.006223968
Sample Covariance Matrix: 4.459059 -0.5002803 0.4009162 -0.497402
    -0.02461824 -0.5002803 3.742368 1.073143 -1.192232 -0.02760972 0.4009162
    1.073143 6.119105 1.029895 -0.6640079 -0.497402 -1.192232 1.029895
    3.077092 0.2085159 -0.02461824 -0.02760972 -0.6640079 0.2085159 1.804029
Mean Norm Error: 0.06017975
Covariance Matrix Norm Error: 1.608463
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