11th, Mar, 2019 Mon

Python Code

Q1

1.

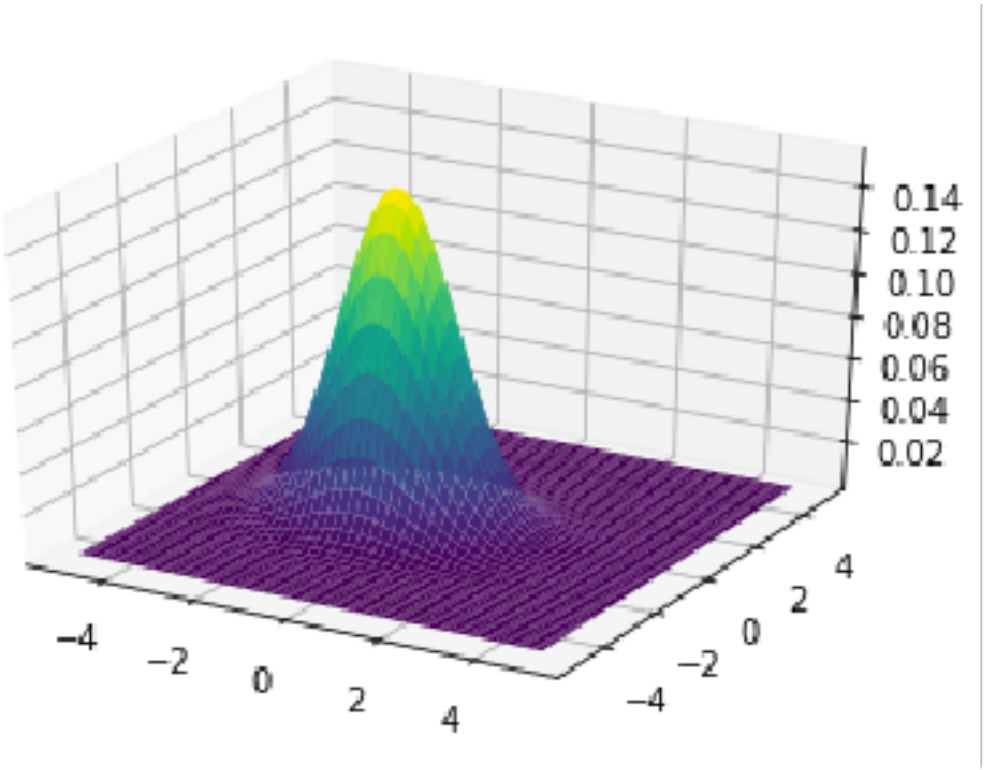
```
import numpy as np
import matplotlib.pyplot as plt
from matplotlib.mlab import bivariate_normal
from mpl_toolkits.mplot3d import Axes3D

mu_x = -0.708
sigma_x = np.sqrt(1.416)

mu_y = -0.3725
sigma_y = np.sqrt(0.749)

x = np.linspace(-5,5,500)
y = np.linspace(-5,5,500)
X, Y = np.meshgrid(x,y)
Z = bivariate_normal(X,Y,sigma_x,sigma_y,mu_x,mu_y)

fig = plt.figure()
ax = fig.gca(projection='3d')
ax.plot_surface(X, Y, Z,cmap='viridis',linewidth=0)
ax.set_xlable('X axis')
ax.set_ylable('Y axis')
ax.set_zlable('Z axis')
plt.show()
```



2.

```
import numpy as np
import scipy.linalg as spla
import matplotlib.pyplot as plt
import pandas as pd

mean = [0, 0]
cov = [[1.416, 0], [0, 0.749]]

x, y = np.random.multivariate_normal(mean, cov, 10000).T
datatoexcel = pd.ExcelWriter("FromPython.xlsx",engine='xlsxwriter')
pd.DataFrame(x, y).to_excel(datatoexcel, sheet_name='sheet')
datatoexcel.save
```

Results can be seen on Q1.2.xlsx

3.
Results can be seen on Exercise Paper

4.
Results can be seen on Exercise Paper

5.
Results can be seen on Exercise Paper

*6.

```
import numpy as np
import pandas as pd

mean = [-0.708, -0.3745]
cov = [[1.416, 0.257], [0.257, 0.749]]

x, y = np.random.multivariate_normal(mean, cov, 10000).T
data = pd.DataFrame(x, y)
datatoexcel = pd.ExcelWriter("MyPython.xlsx",engine='xlsxwriter')
data.to_excel(datatoexcel, sheet_name='sheet1')
datatoexcel.save()
```

Results can be seen on Q1.3.xlsx

Q2
2.
Results can be seen on Q2.xlsx

3.4.5.
Results can be seen on Exercise Paper

Q3
1.

```
import numpy as np
import pandas as pd
import random
```

```
mean = [-0.708, -0.3745]
cov = [[1.416, 0], [0, 0.749]]

x, y = np.random.multivariate_normal(mean, cov, 10).T
data = pd.DataFrame(x, y)
datatoexcel = pd.ExcelWriter("Q3.xlsx",engine='xlsxwriter')
data.to_excel(datatoexcel, sheet_name='sheet2')
datatoexcel.save()
```

Q4

1.

Results can be seen on Q4.1xlsx

2.3.4

Results can be seen on Exercise Paper

5.

Results can be seen on Q4.1xlsx and Exercise Paper

6.

Results can be seen on Exercise Paper