COMPUTATIONAL PHYSICS LAB (PH49012)

LAB SHEET - 9

Hemant Kumar
16PH20017

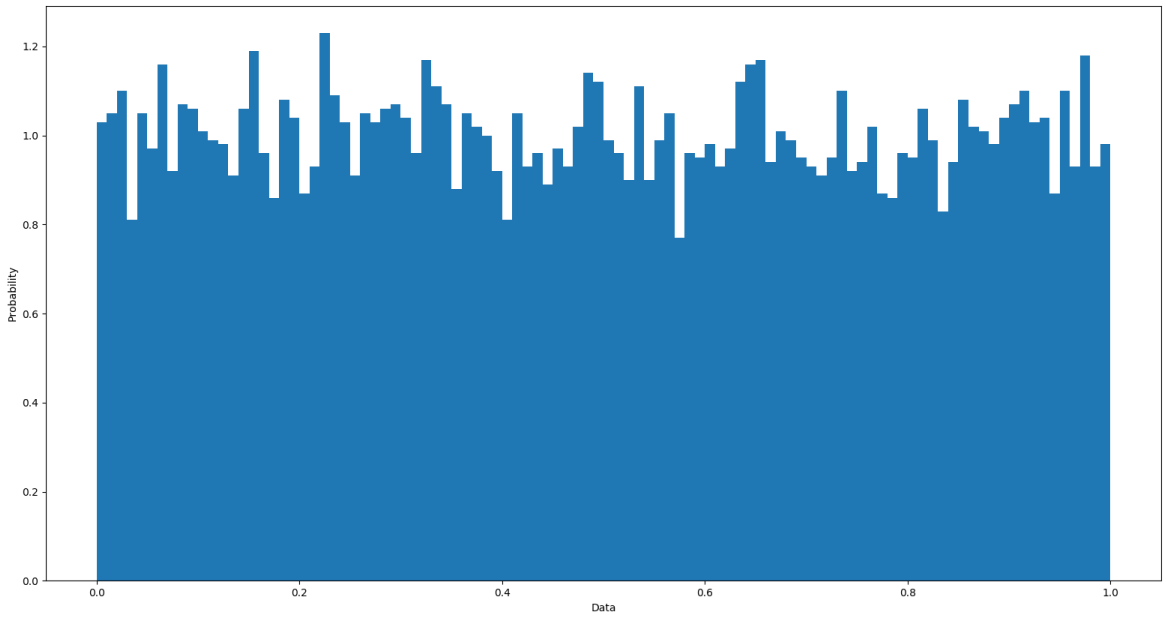
Question 1:

```
import matplotlib.pyplot as plt
import numpy as np

#generate a 1D array of random numbers of size=1000
x=np.random.rand(10000)

#bins denote number of columns
plt.hist(x, density=True, bins=100) # `density=False` would make counts
plt.ylabel('Probability')
plt.xlabel('Data');

plt.show()
```



Question 2:

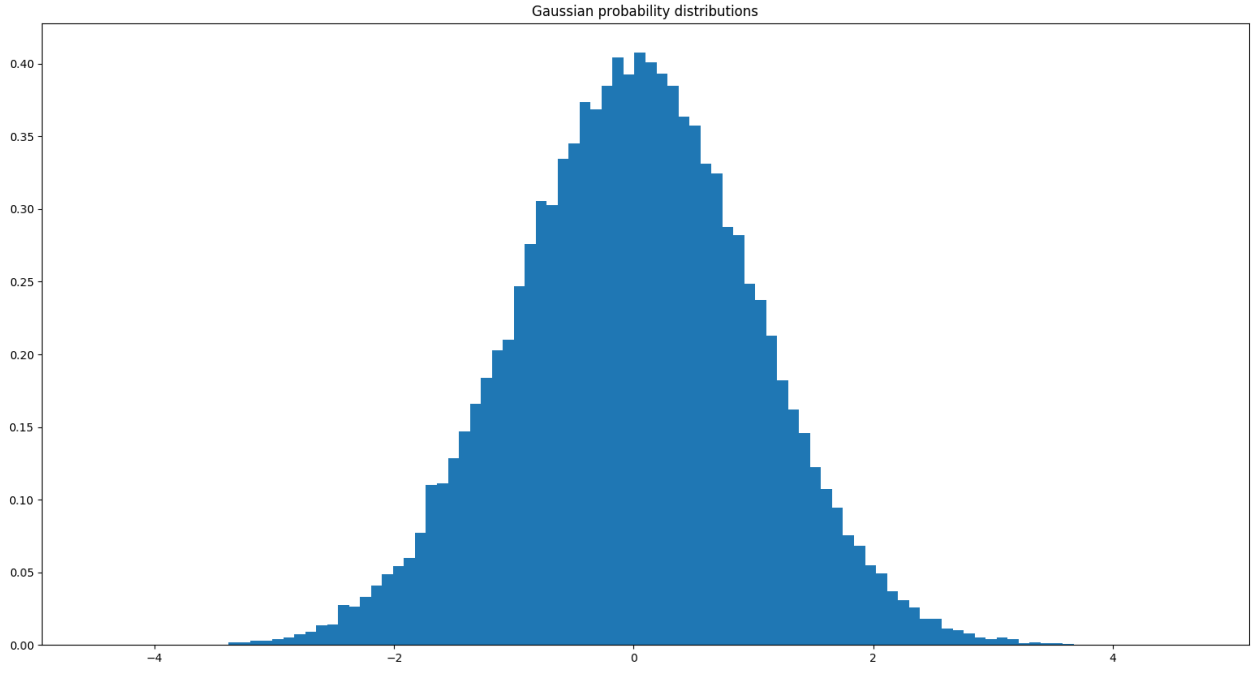
```
import matplotlib.pyplot as plt
import numpy as np

# define gaussian distribution parameters sigma= standard ddeviation and mu = mean
sigma = 0
mu = 1

#generate 5*10^4 random numbers from gaussian distribution
x=np.random.normal(sigma, mu, size=5*10**4)

# generate a histogram using x and store it as an array of 100 bins in bins variable
count, bins, ignored = plt.hist(x,100,density=True)

# plot the density funtion after defining it as a function of mu, sigma and bins
plt.plot(bins, 1/(sigma*np.sqrt(2*np.pi))*np.exp( -(bins-mu)**2 / (2*sigma**2) ), linewidth=2, color='r' )
plt.title("Gaussian probability distributions")
plt.show()
```



Question 3:

```
import numpy as np
from math import sqrt
import matplotlib.pyplot as plt

t0=0 #initial time
tn=5 #final time
n=500 #steps
dt=(tn-t0)/n #step size
D=1 #diffusion constant

# initialise (rx,ry) as (0,0)
rx=[0]
ry=[0]

# rx(i+1) = rx(i) + sqrt(D) * dt * G(i)
for i in range(n):
        rx.append(rx[i]+sqrt(D)*dt*np.random.randn())
        ry.append(ry[i]+sqrt(D)*dt*np.random.randn())
plt.title("brownian particle diffusing in fluid medium")
plt.plot(rx,ry, marker=">", linestyle="--")
plt.show()
```