

# hw10\_question1

December 5, 2024

```
[ ]: from google.colab import drive
drive.mount('/content/drive', force_remount=True)
!apt-get install texlive texlive-xetex texlive-latex-extra pandoc > /content/
↪drive/MyDrive/installs.txt
!pip install pypandoc > /content/drive/MyDrive/pandoc_installs.txt
```

Mounted at /content/drive

Extracting templates from packages: 100%

## 1 Question 1

### 1.1 Part A

```
[1]: from numpy import random
import numpy as np
import matplotlib.pyplot as plt
from scipy.stats import norm

x = random.normal(loc=5, scale=1, size=(1, 100))

print(x[0])
```

```
[3.68757447 5.52661666 5.09497826 4.88684317 3.85297905 3.60173846
 4.27354304 5.83386785 5.56563855 5.10525298 5.16462787 4.37866933
 5.0192959  4.62370623 2.02914245 4.08982215 6.20046321 4.82299019
 4.52947859 6.66729452 4.80429576 2.20467535 4.91045917 6.19706197
 4.59161588 4.39142523 5.78679632 5.91960706 6.94488794 5.14651206
 4.67496675 5.49026471 5.81709553 6.1624702  5.12126365 5.4600119
 4.71167575 7.43893405 3.18316307 5.3367248  3.56563071 6.08489198
 4.55456714 4.58033689 4.33226893 3.87028322 3.60228658 3.16681233
 4.62130507 5.71902801 5.04103773 5.94423745 5.0217606  7.30227426
 4.7234378  4.28395574 2.86754028 5.95629816 4.65991073 5.12478231
 5.42811268 6.46449095 5.53319662 5.23138666 4.75663376 3.71425482
 3.62850803 3.80894065 4.55418397 7.7084876  4.11414491 5.91120615
 4.62604869 3.85929815 5.41488676 4.7861139  5.45336132 4.92662916
 5.19462943 3.18327188 4.27499576 4.85286853 3.59516655 5.00690964
 6.7159407  4.58651958 3.64531492 3.97277654 3.77616091 5.90079125]
```

```
4.98884203 5.42680207 4.10550099 4.04435238 5.22818936 4.92845563
3.5102055 4.31589177 5.6932358 3.34017279]
```

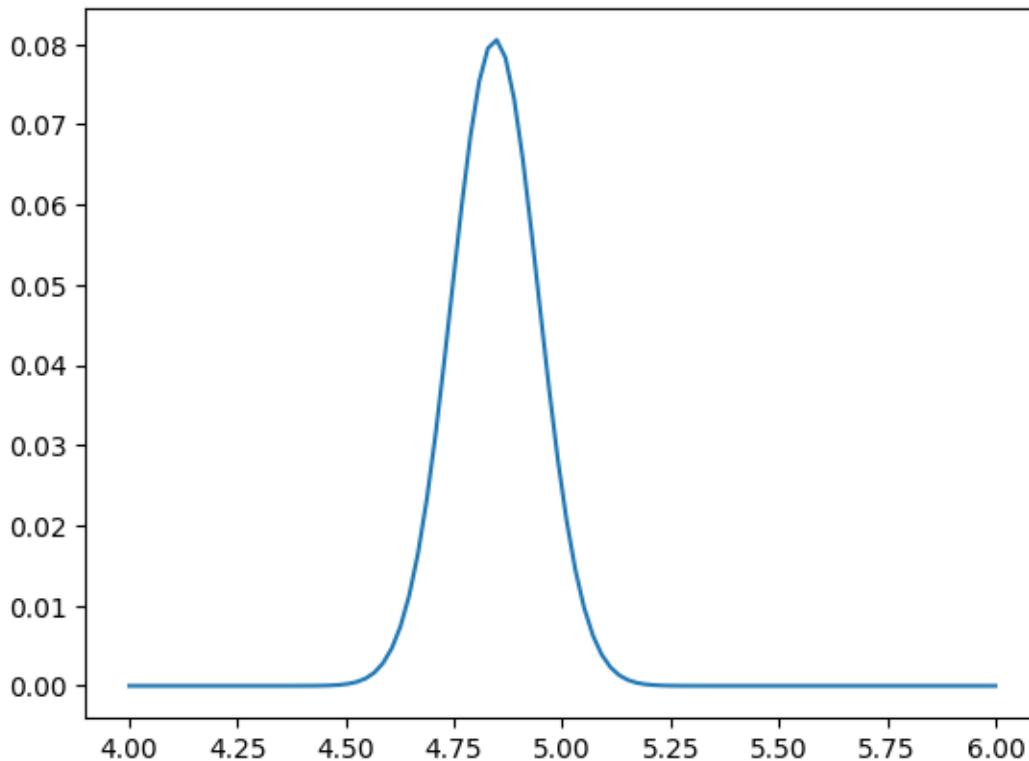
## 1.2 Part B

Plotting the posterior density

```
[2]: mu_hat = x.mean()
mu_values = np.linspace(4, 6, 100)

likelihood = np.vectorize(lambda mu_hat: np.exp(np.log(norm.pdf(x, loc=mu_hat,
↪scale=1))).sum()))
L_i = likelihood(mu_values)

plt.plot(mu_values, L_i / L_i.sum());
plt.show()
```

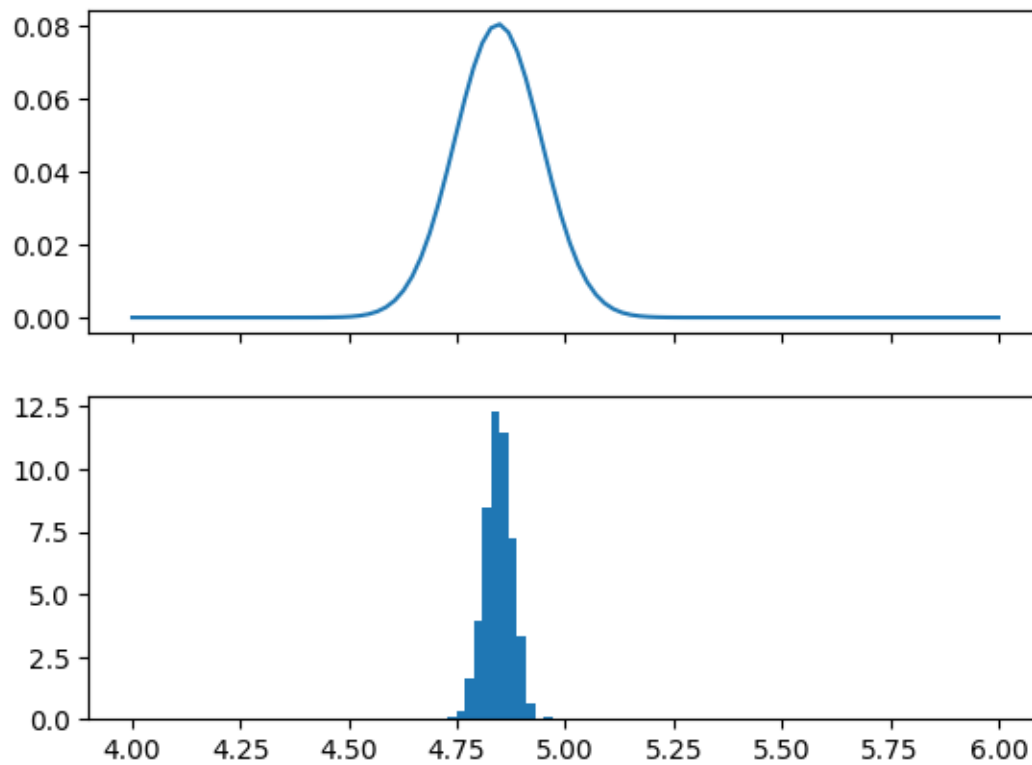


## 1.3 Part C

```
[3]: fig, (ax1, ax2) = plt.subplots(2, 1, sharex='col')
ax1.plot(mu_values, L_i / L_i.sum())

posterior_samples = norm.rvs(loc=mu_hat, scale=1/np.sqrt(1000), size=1000)
```

```
ax2.hist(posterior_samples, density=True, bins=mu_values);
```



```
[ ]: !cp "../drive/My Drive/Colab Notebooks/hw10_question1.ipynb" ./hw10_question1.  
      ↪ ipynb  
      !jupyter nbconvert --to PDF "hw10_question1.ipynb"
```