AA 274: Principles of Robotic Autonomy
Section 1: OS Setup, Git, Python

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1. Define a sin function using NumPy

```
#!/usr/bin/env python3


#import the required libraries
from ast import In
from cmath import pi
import math
import numpy as np
import matplotlib.pyplot as plt

from scipy.optimize import minimize


#Defined a sin function using NumPy
def sin(x):

    return math.sin(x)
```

2. Find the minimum of the function using SciPy

```
#minimum of the sin function using SciPy
#initial guess
x_0 = 0

min = minimize(sin, x_0, method='nelder-mead', options={'xtol': 1e-8, 'disp': True})

print("The minimum of the sin function using scipy is: '{}' " .format(min.fun))



Output:
```

```
The minimum of the sin function using scipy is: '-1.0'
```

3. Integrate the function from [0, 1] using SciPy

```
#integrate the function from [0,1] using scipy

from scipy.integrate import quad

result = quad(sin, 0, 1)

print("Integral of Sinx from 0 to 1 '{}'".format(result[0]))
```

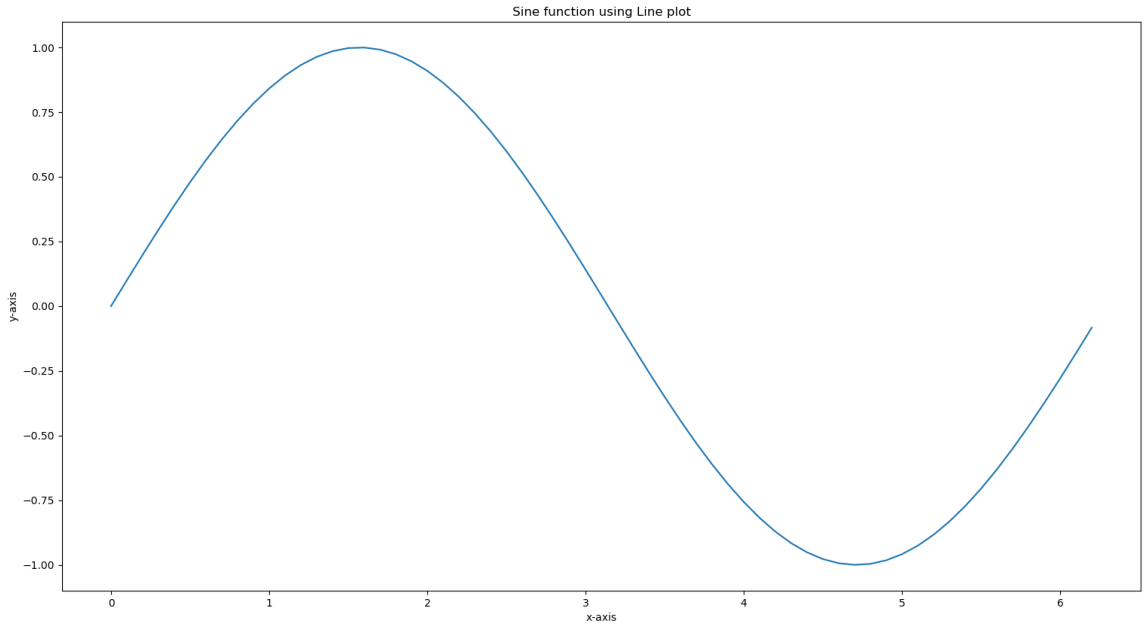
```
Output: Integral of Sinx from 0 to 1 '0.45969769413186023'
```

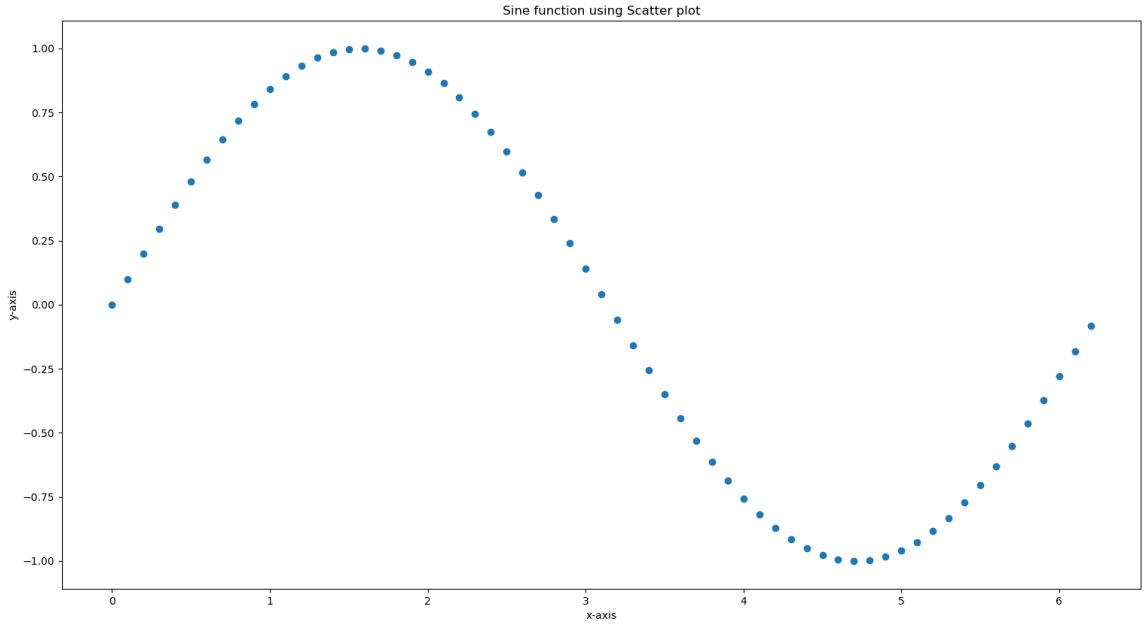
4. Plot the function using Matplotlib from [0, 2π]

```
#plot the function using matplotlib from [0,2*pi]
x = np.arange(0, 2*np.pi, 0.1)
y = np.sin(x)



plt.plot(x,y)
plt.title("Sine function using Line plot")
plt.xlabel("x-axis")
plt.ylabel("y-axis")
plt.show()

plt.scatter(x,y)
plt.title("Sine function using Scatter plot")
plt.xlabel("x-axis")
plt.ylabel("y-axis")
plt.show()
```

Console Output:

```
karthikpythireddi@karthikpythireddi-Precision-5540:~/AA274A_SECTIONS/s1/code$
python3 Section1_Submission.py
Optimization terminated successfully.
         Current function value: -1.000000
         Iterations: 39
         Function evaluations: 78
The minimum of the sin function using scipy is: '-1.0'
Integral of Sinx from 0 to 1 '0.45969769413186023'
```




Sine function using Scatter plot
y-axis
x-axis
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
1
2
3
4
5
6