311 – Numerical Computations
Lab 9: Python Plotting using Matplotlib / Reading from Files
A)Plotting Data (Scatter/Plot):

How to install Matplotlib:

pip install matplotlib

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

X1 = np.array([1,3,6,7,10])


Y1 = np.array([5,8,14,19,25])
Y2 = np.array([12,17,28,38,50])
Y3 = np.array([3,4,5,6,57])


plt.scatter(X1,Y1, c ="red",  linewidths = 1,  marker ="p",
        edgecolor ="blue", label='LABEL1' )


plt.scatter(X1,Y2,label='LABEL2')


plt.plot(X1,Y3,label='LABEL3')


#Optional:
plt.xlabel('XLABEL')
plt.ylabel('YLABEL')
plt.title('Title')
plt.grid()
plt.legend()
#plt.ylim(0, 60)
#plt.xlim(0, 11)
#------------------------------------------------
plt.show()
```
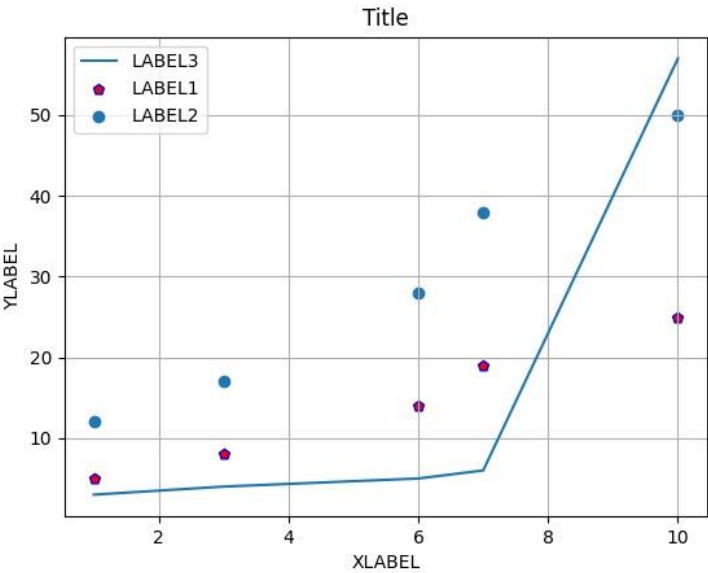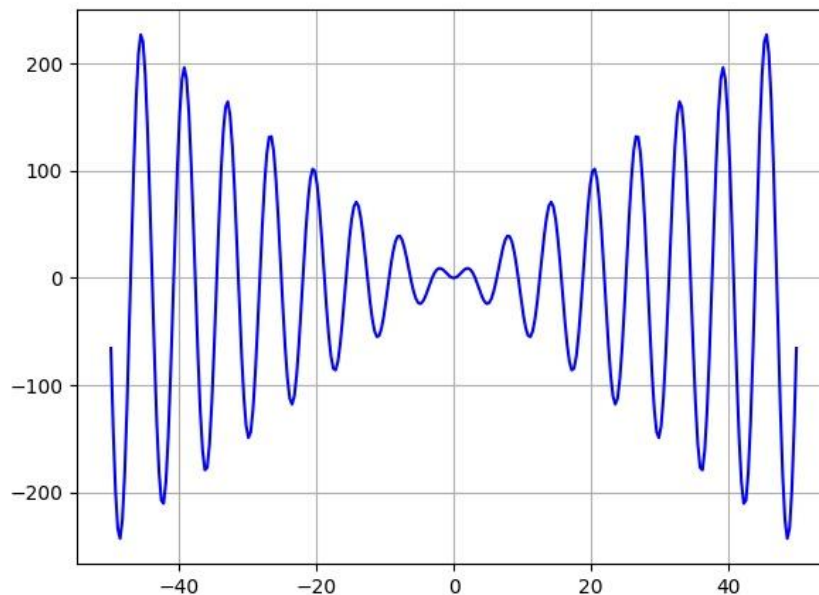
B) Plotting Functions:

```
import numpy as np
import matplotlib.pyplot as plt
x = np.linspace(-50,50,300)  #Pay attention to 300
y = 5*x*np.sin(x)            #f(x)=5xsin(x)


plt.plot(x, y,color="blue")
plt.grid()
plt.show()
```

C) Reading From File:
Same as program B (but reading Data from file):

```python
import numpy as np
import matplotlib.pyplot as plt
f = open("x.txt", "r")

X=f.readline().split()
X=[int(c) for c in X1]
X=np.array(X1)

Y1=f.readline().split()
Y1=[int(c) for c in Y1]
Y1=np.array(Y1)

Y2=f.readline().split()
Y2=[int(c) for c in Y2]
Y2=np.array(Y2)

Y3=f.readline().split()
Y3=[int(c) for c in Y3]
Y3=np.array(Y3)
f.close()

plt.scatter(X,Y1,label='LABEL1' )

plt.scatter(X,Y2,label='LABEL2')

plt.plot(X,Y3,label='LABEL3')
plt.grid()
plt.legend()
plt.show()
```

Lab Task:

1- Prepare a file of the first 100 Prime Numbers.

2- Use Matplotlib to draw the first 100 approximations to e (as given in the Theorem of Quiz2).

This is Quiz 2 in case you need the question:

311- Quiz 2

Theorem:

$$e = \lim_{n \to \infty} \sqrt[p_n]{2 \times 3 \times 5 \times ... \times p_n}$$

where p_n is the "prime" number n (2 is the prime number 1 then 3, 5, ...).

Examples: $e \approx \sqrt[5]{2 \times 3 \times 5} \approx \sqrt[7]{2 \times 3 \times 5 \times 7}$

Given a List of the first N primes (so N is the length of the list), write a function that takes this list and returns a list of the first N approximations of e using the above theorem.

def Quiz2 (L):   #(e.g. L=[2,3,5,7,11,13,17,19,23,29])