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**Project Idea**: Fibonacci Sequence Visualization and Applications.

This project explores the Fibonacci sequence in multiple ways, using visualizations to showcase its growth and relationship to various phenomena in nature and mathematics. The main components of this project are:

* **Fibonacci Sequence Calculation**
* **Line Plot Visualization of the Sequence**
* **Fibonacci Spiral Visualization (Polar Plot)**

The project can be expanded to analyze how the Fibonacci sequence appears in nature, architecture, and even data science.

* **Golden Ratio in Nature:** Extend the project by exploring how the Fibonacci sequence is connected to the golden ratio (approximately 1.618), which appears in natural patterns like the arrangement of leaves, the branching of trees, and the shape of shells. one could apply machine learning or data analysis to classify images from nature based on Fibonacci patterns.

**Code Implementation:**

**>>>**

import matplotlib.pyplot as plt

import numpy as np

def fibonacci\_sequence(n):

sequence = [0, 1]

for i in range(2, n):

sequence.append(sequence[i-1] + sequence[i-2])

return sequence

def plot\_fibonacci(n):

sequence = fibonacci\_sequence(n)

plt.figure(figsize=(10, 6))

plt.plot(sequence, marker='o', color='royalblue', markersize=8, linewidth=2.5, linestyle='--')

plt.fill\_between(range(n), sequence, color="lightblue", alpha=0.3)

plt.title(f'Fibonacci Sequence up to {n} Terms', fontsize=16, fontweight='bold', color='darkslateblue')

plt.xlabel('Index', fontsize=14)

plt.ylabel('Fibonacci Number', fontsize=14)

plt.grid(True, color='gray', linestyle='--', linewidth=0.5)

plt.show()

def plot\_fibonacci\_spiral(n):

sequence = fibonacci\_sequence(n)

angle = np.linspace(0, 4 \* np.pi, len(sequence))

fig = plt.figure(figsize=(8, 8))

ax = fig.add\_subplot(111, polar=True)

ax.plot(angle, sequence, color='teal', linewidth=2.5)

for i in range(len(sequence)):

ax.plot(angle[i], sequence[i], marker='o', markersize=5 + i \* 0.5, color=plt.cm.viridis(i / n))

ax.set\_title(f'Fibonacci Spiral up to {n} Terms', va='bottom', fontsize=16, fontweight='bold', color='darkslateblue')

plt.show()

n\_terms = 10

plot\_fibonacci(n\_terms)

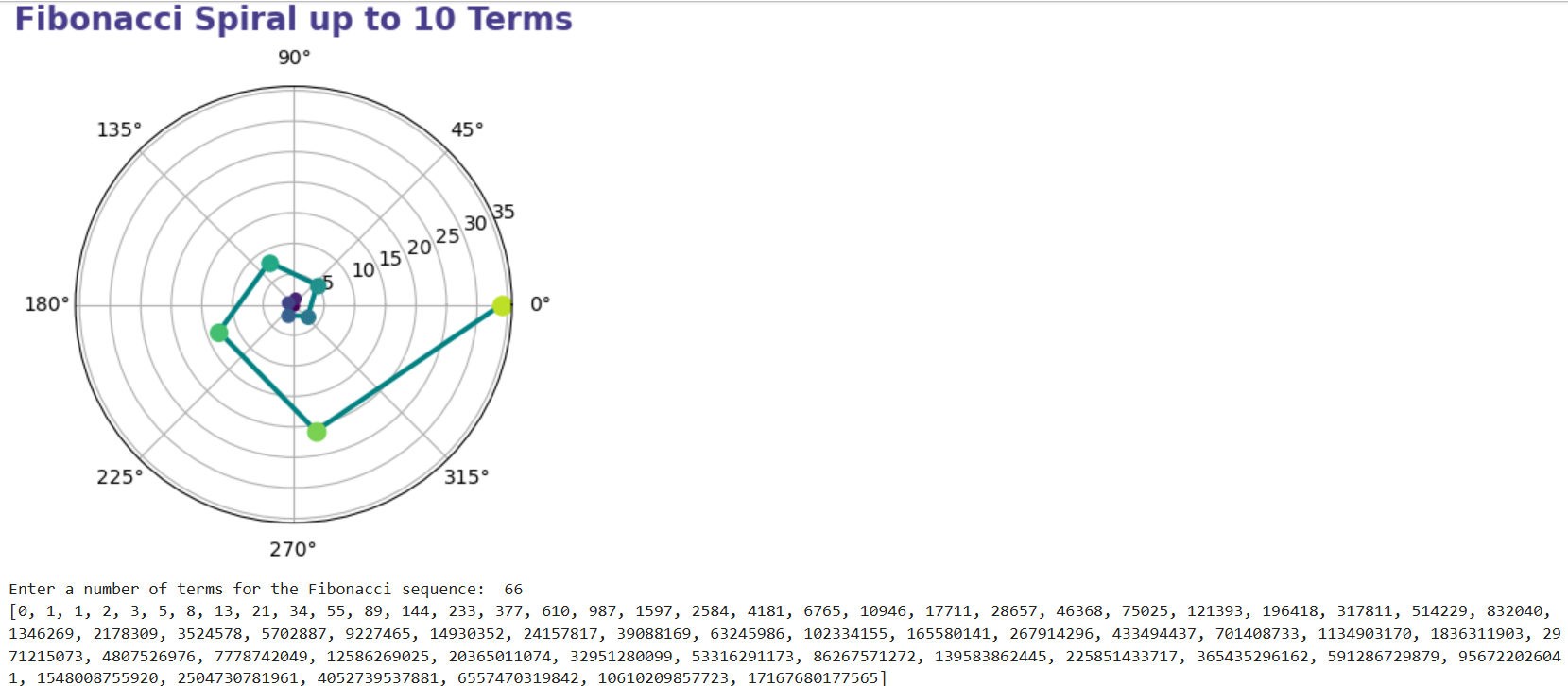
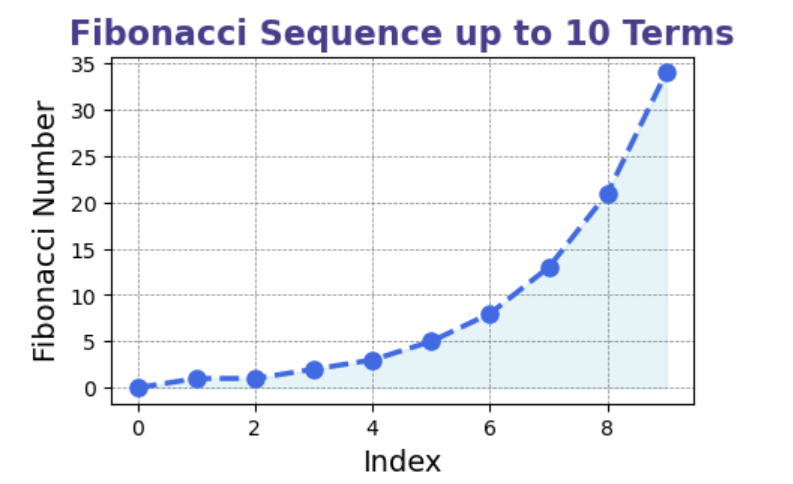
plot\_fibonacci\_spiral(n\_terms)

input\_ = int(input("Enter a number of terms for the Fibonacci sequence: "))

print(fibonacci\_sequence(input\_))

>>>

**Output:**

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