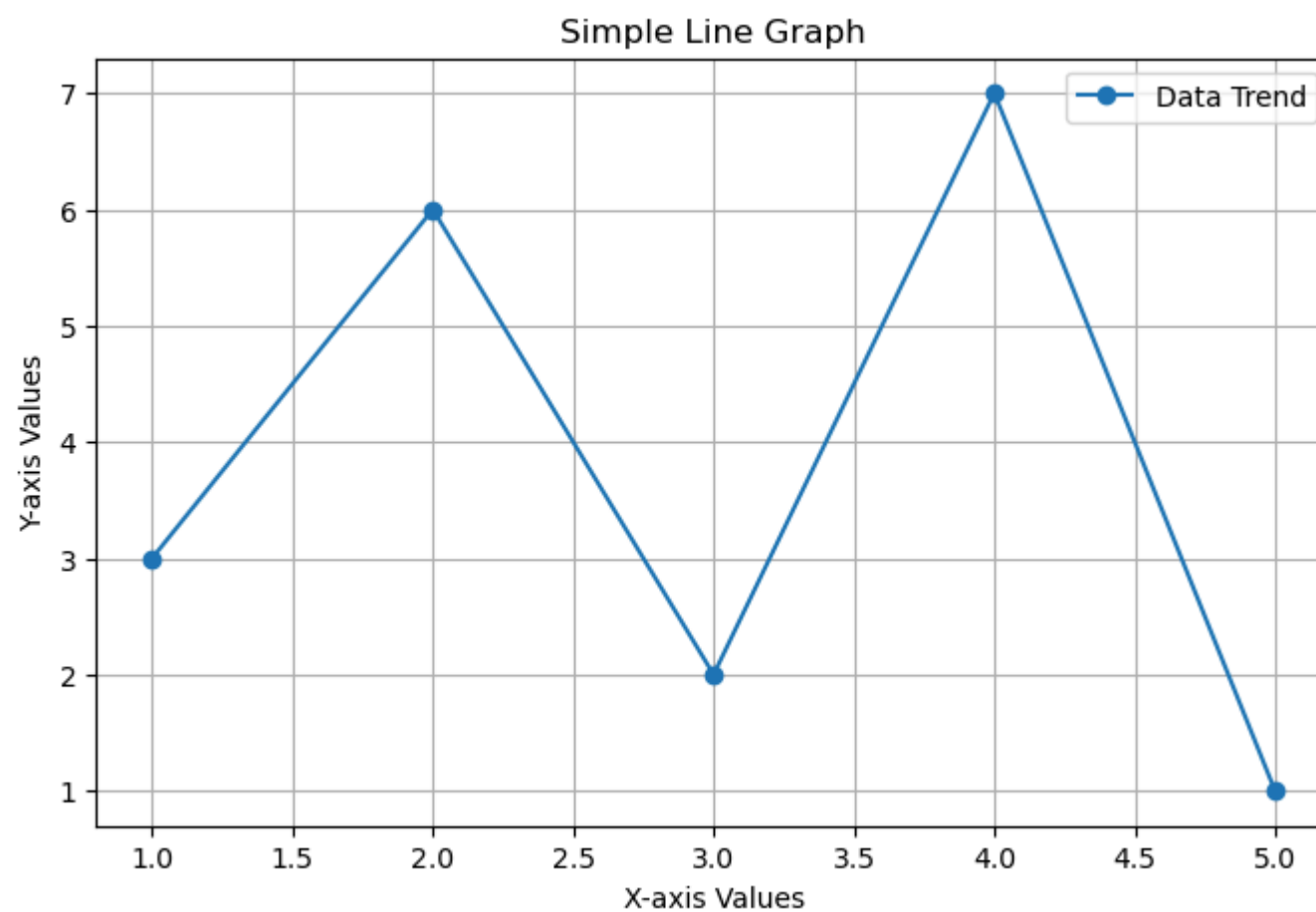**Data visualization Using Matplotlib**

In [128]:
```python
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

In [129]:
```python
x = [1, 2, 3, 4, 5]
y = [3, 6, 2, 7, 1]
```

In [130]:
```python
plt.figure(figsize=(8, 5))
plt.plot(x, y, label='Data Trend', marker='o', linestyle='-')
plt.xlabel('X-axis Values')
plt.ylabel('Y-axis Values')
plt.title('Simple Line Graph')
plt.legend()
plt.grid(True)
plt.show()
```


In [131]:
```python
x1 = [1,2,3]
y1 = [2,4,1]
x2 = [1,2,3]
y2 = [4,1,3]
```

In [132]:
```python
plt.figure(figsize=(8, 5))
plt.plot(x1, y1, label = "Line 1", color='blue', linewidth=3, linestyle='dashed', marker='o')
plt.plot(x2, y2, label = "Line 2", color='red', linewidth=2, linestyle='-', marker='s')
plt.xlabel('X-axis')
plt.ylabel('Y-axis')
plt.title('Two Lines on the Same Graph')
plt.legend()
plt.grid(True)
```
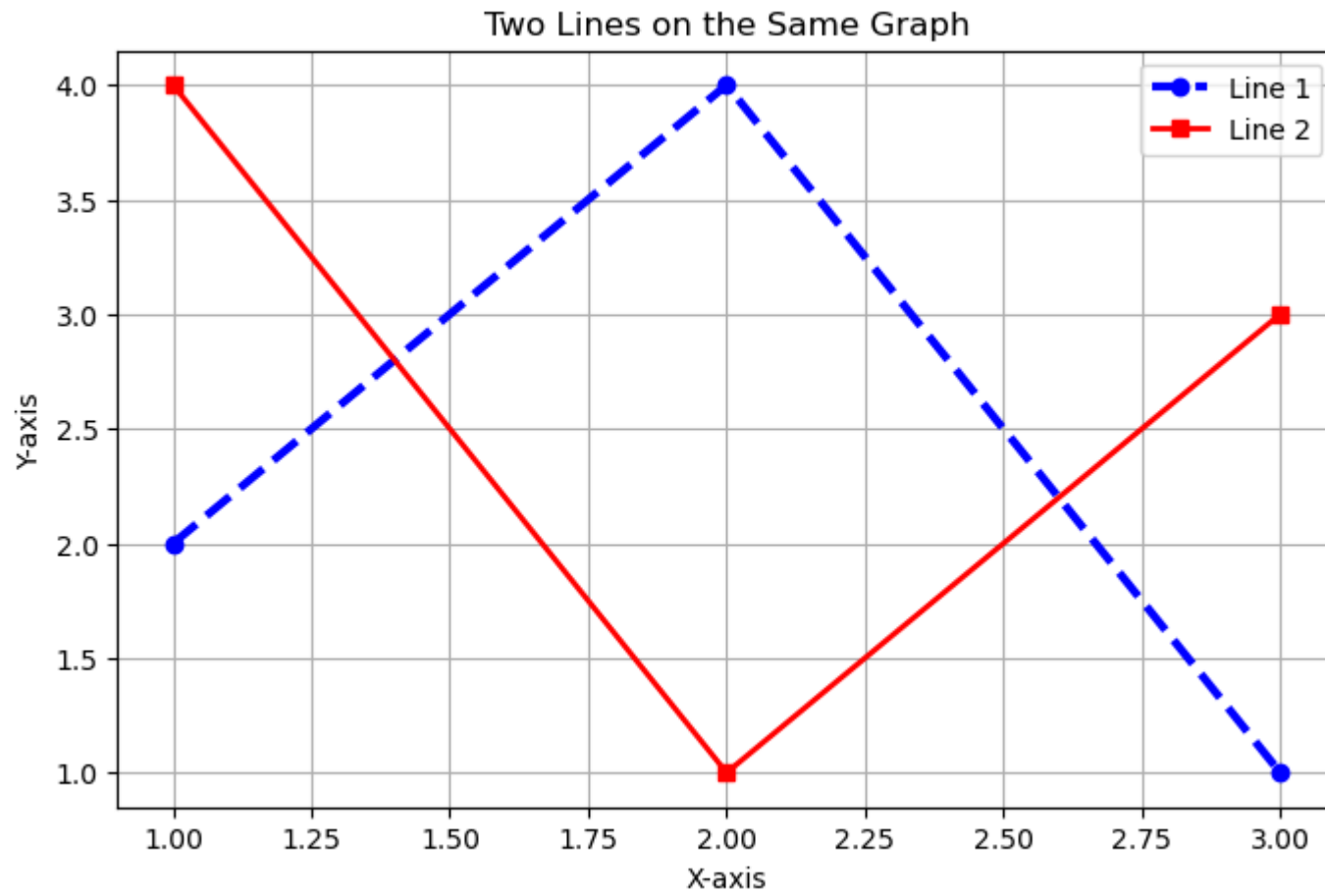

In [133]:
```python
plt.scatter(x1, y1, color='blue', s=80, label='Points Line 1')
plt.scatter(x2, y2, color='red', s=80, label='Points Line 2')
plt.show()
```
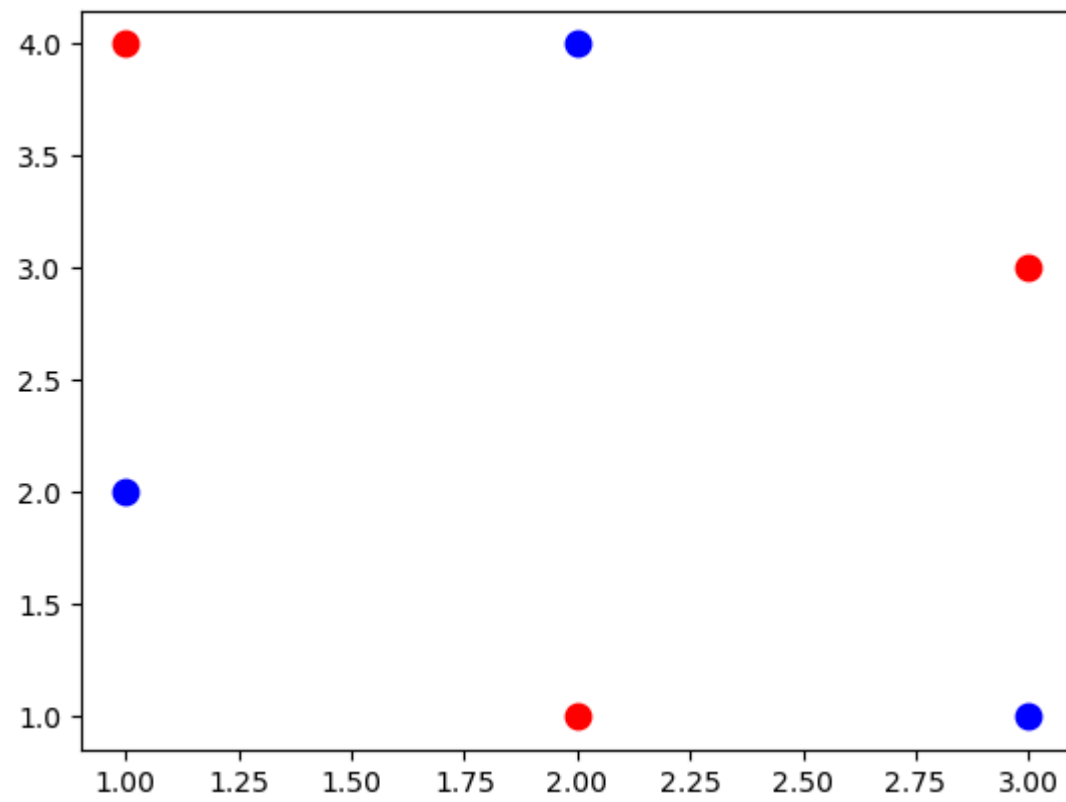

In [134]:
```python
x = [1, 2, 3, 4, 5]
y1 = [10, 12, 14, 16, 18]
y2 = [5, 7, 9, 11, 13]
y3 = [2, 4, 6, 8, 10]
```

In [135]:
```python
x_values = [0,1,2,3,4,5]
y_values = [0,1,4,9,16,25]
```

```
In [136]: plt.figure(figsize=(8, 5))
          plt.plot(x_values, y_values, color='darkblue', linewidth=2, label='Y = X^2')
          plt.fill_between(x_values, y_values, color='skyblue', alpha=0.5, label='Area Under Curve')
          plt.xlabel('X-axis')
          plt.ylabel('Y-axis')
          plt.title('Line Graph with Fill Between (Y = X^2)')
          plt.legend()
          plt.grid(axis='y', linestyle='--')
          plt.show()
```


Line Graph with Fill Between (Y = X^2)
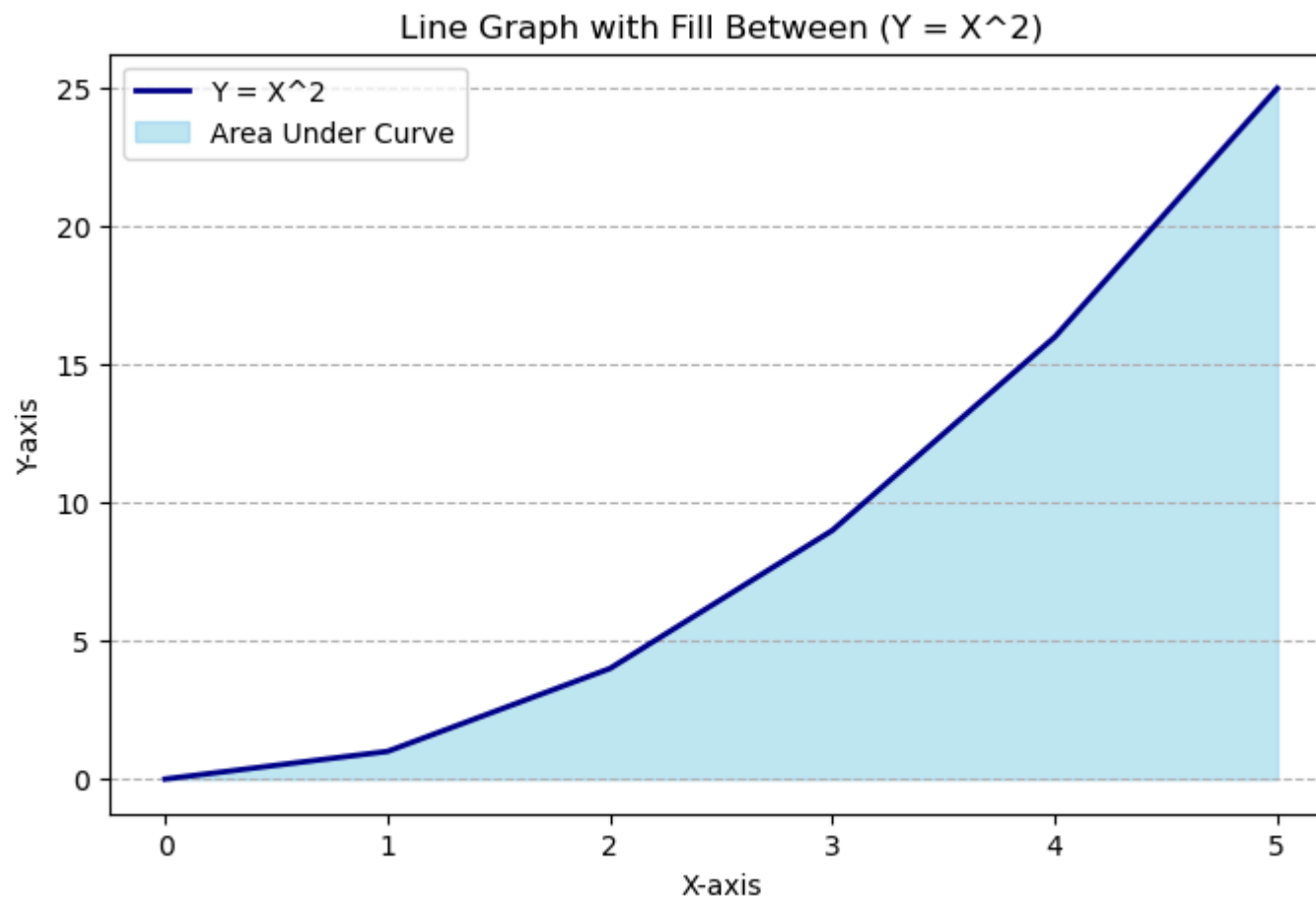
```
In [137]: from scipy.interpolate import make_interp_spline
          x = np.array([1, 2, 3, 4, 5, 6, 7, 8, 9, 10])
          y = np.array([2, 4, 5, 7, 8, 8, 9, 10, 11, 12])
```

```
In [138]: X_Y_Spline = make_interp_spline(x, y)
          X_ = np.linspace(x.min(), x.max(), 500)
          Y_ = X_Y_Spline(X_)

          plt.figure(figsize=(8, 5))
          plt.plot(x, y, 'o', label='Original Data Points', color='red', markersize=6)
          plt.plot(X_, Y_, label='Cubic Spline Interpolation', color='darkgreen', linewidth=2)
          plt.xlabel('X-axis')
          plt.ylabel('Y-axis')
          plt.title('Data Interpolation with Cubic Spline')
          plt.legend()
          plt.grid(True)
          plt.show()
```
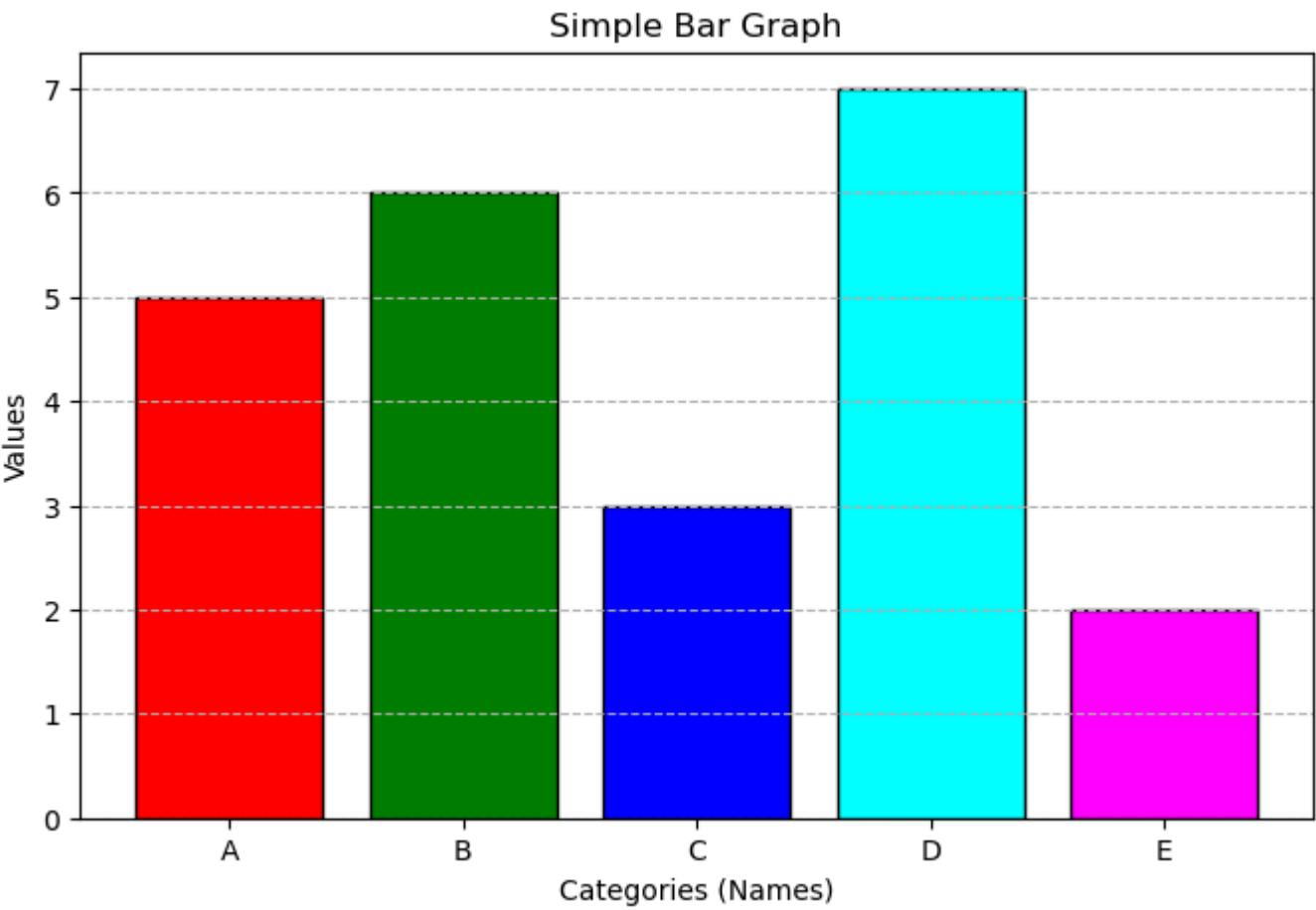

Data Interpolation with Cubic Spline
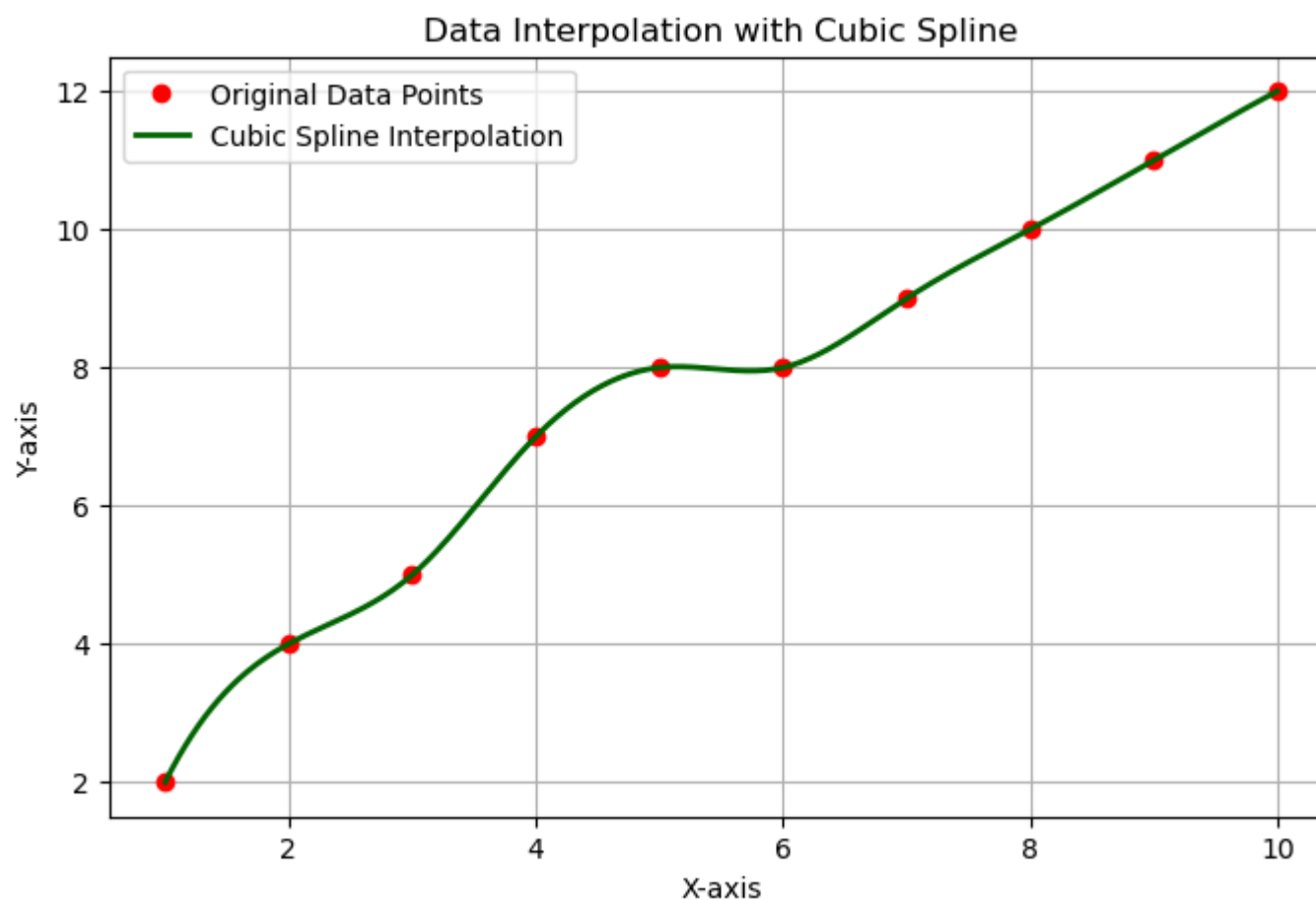
BAR GRAPH

In [139]:
```python
values = [5, 6, 3, 7, 2]
names  = ["A", "B", "C", "D", "E"]
```

In [140]:
```python
c1 =['red', 'green']
c2 =['b', 'g']
bar_colors = ['red', 'green', 'blue', 'cyan', 'magenta']
plt.figure(figsize=(8, 5))
plt.bar(names, values, color=bar_colors, edgecolor='black', linewidth=1)
plt.xlabel('Categories (Names)')
plt.ylabel('Values')
plt.title('Simple Bar Graph')
plt.grid(axis='y', linestyle='--')
plt.show()
```


In [141]:
```python
df = sns.load_dataset("tips")
```

In [142]:
```python
df.head()
```

Out[142]:

	total_bill	tip	sex	smoker	day	time	size
0	16.99	1.01	Female	No	Sun	Dinner	2
1	10.34	1.66	Male	No	Sun	Dinner	3
2	21.01	3.50	Male	No	Sun	Dinner	3
3	23.68	3.31	Male	No	Sun	Dinner	2
4	24.59	3.61	Female	No	Sun	Dinner	4

In [143]:
```python
avg_total_bill = df.groupby('day')['total_bill'].mean()
avg_tip = df.groupby('day')['tip'].mean()

plt.figure(figsize=(8, 6))
p1 = plt.bar(avg_total_bill.index, avg_total_bill, label='Total Bill', color='skyblue')
p2 = plt.bar(avg_tip.index, avg_tip, bottom=avg_total_bill, label='Tip', color='lightcoral')
plt.xlabel('Day of the Week')
plt.ylabel('Average Amount (USD)')
plt.title('Average Total Bill and Tip by Day (Stacked Bar)')
plt.legend()
plt.grid(axis='y', linestyle=':')
plt.show()
```
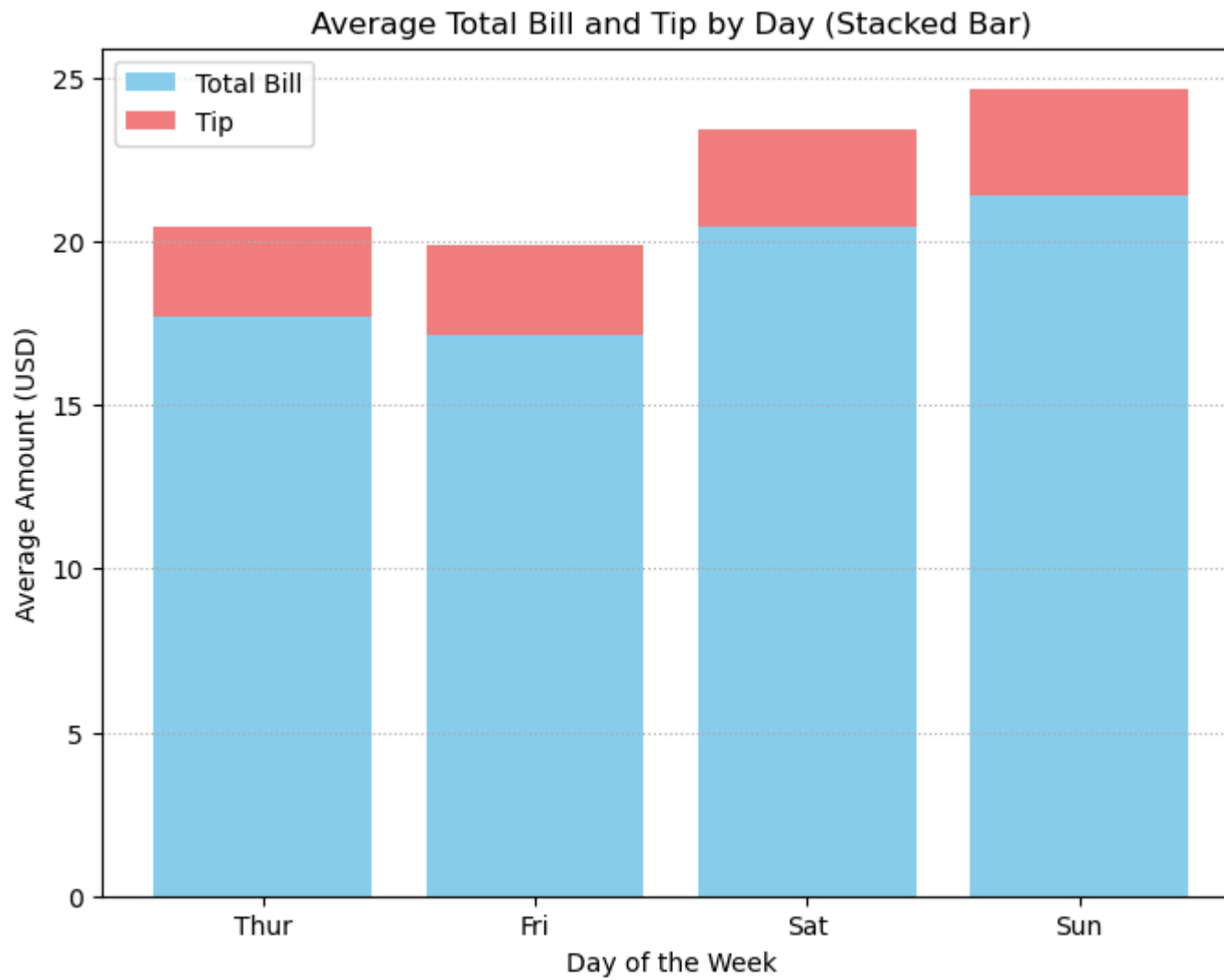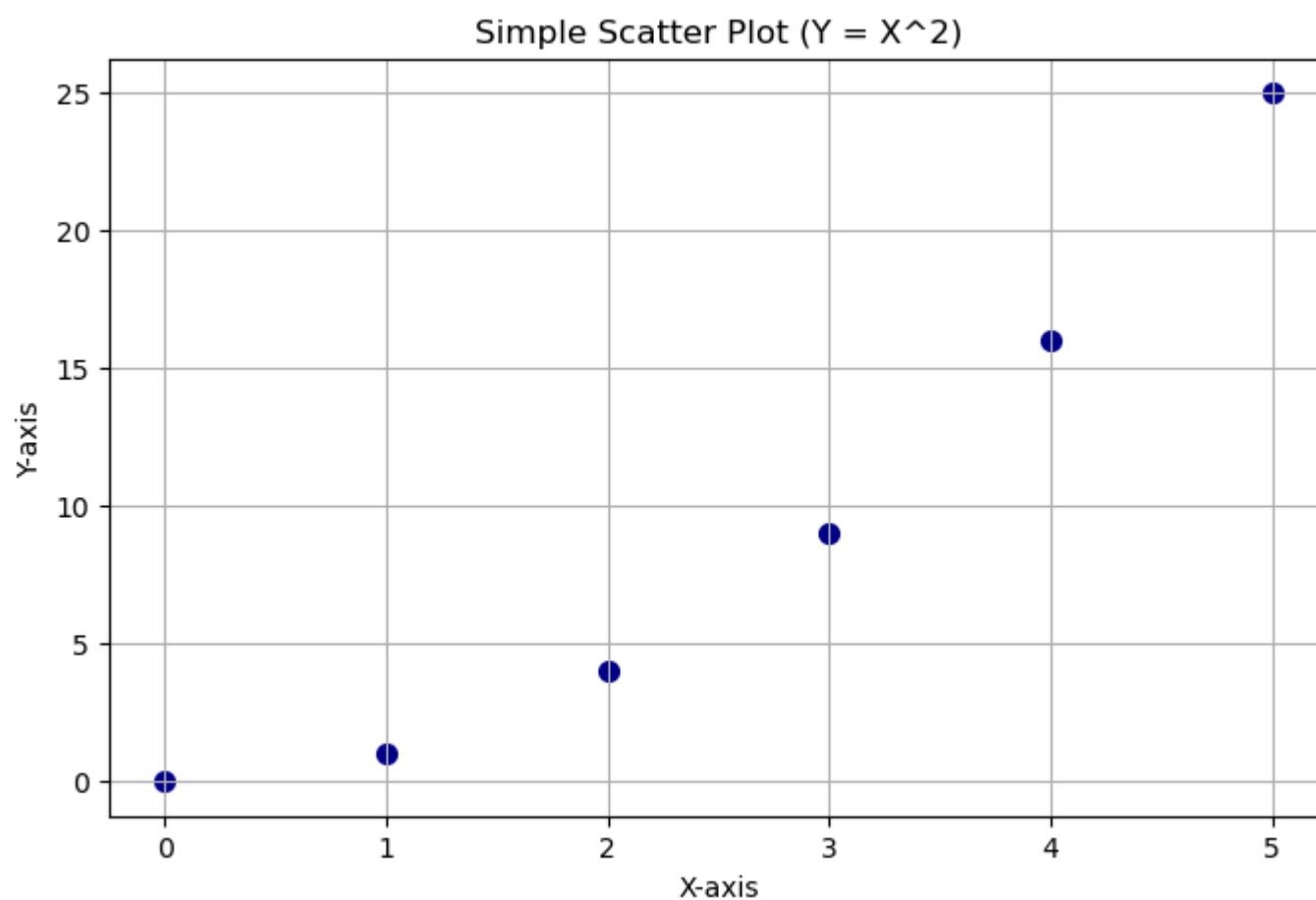

SCATTER PLOT

In [144]:
```python
x_values = [0,1,2,3,4,5]
y_values = [0,1,4,9,16,25]
```
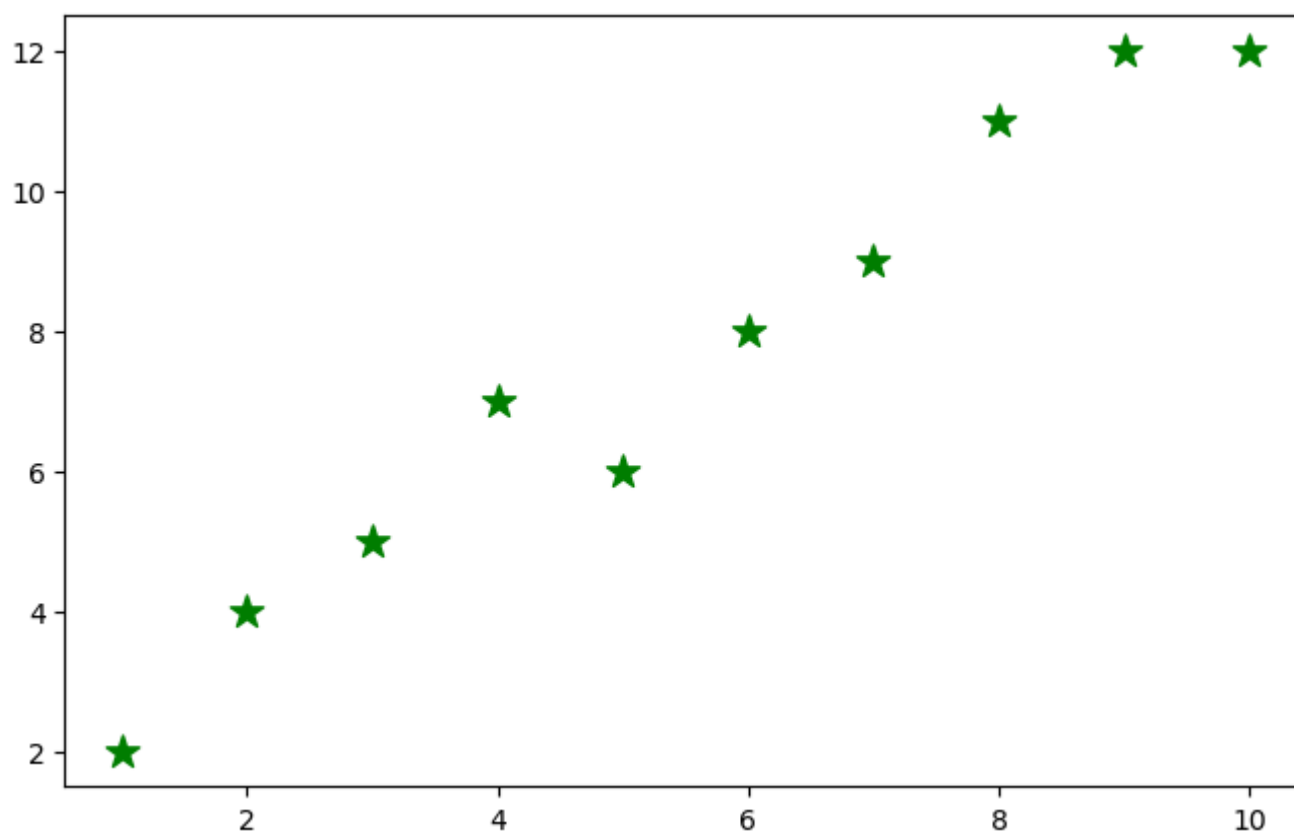
In [145]:
```python
plt.figure(figsize=(8, 5))
plt.scatter(x_values, y_values, color='darkblue', marker='o', s=50)
plt.title('Simple Scatter Plot (Y = X^2)')
plt.xlabel('X-axis')
plt.ylabel('Y-axis')
plt.grid(True)
plt.show()
```


In [146]:
```python
x = [1,2,3,4,5,6,7,8,9,10]
y = [2,4,5,7,6,8,9,11,12,12]
```
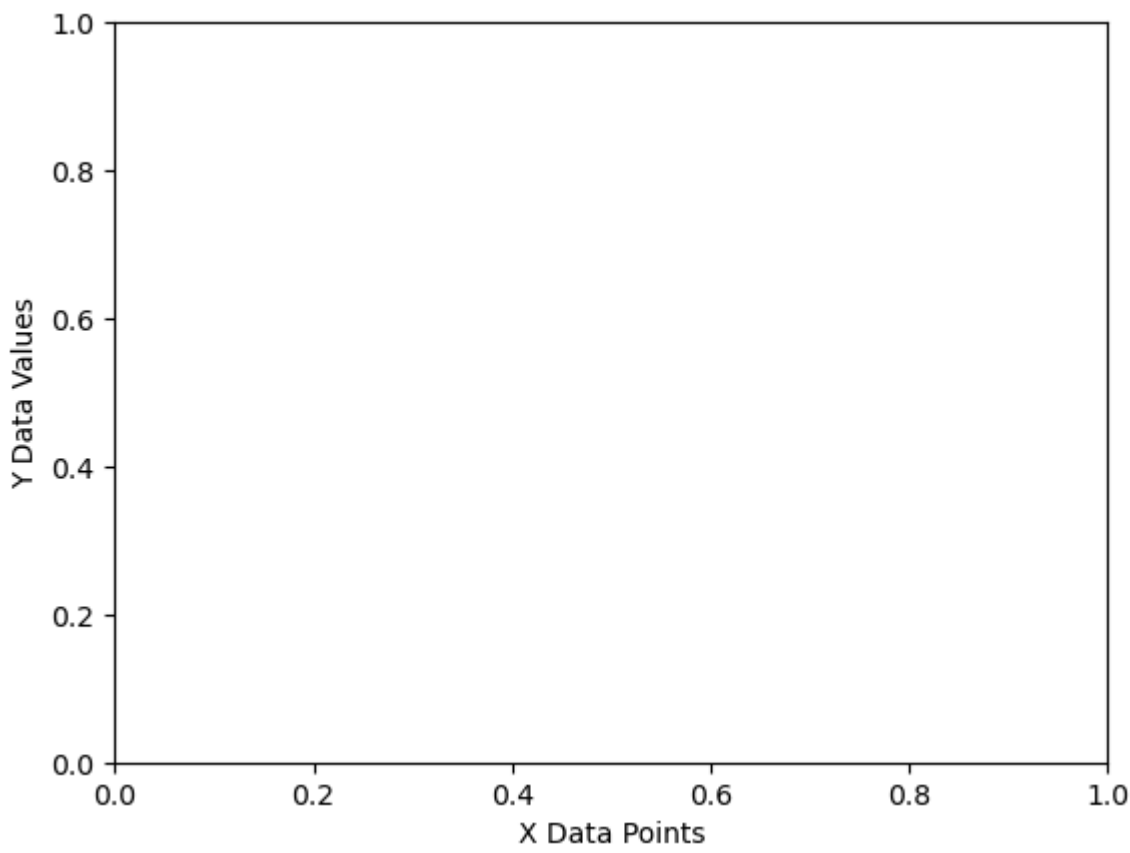
In [147]:
```python
plt.figure(figsize=(8, 5))
plt.scatter(x, y, label= "stars", color="green", marker="*", s=150)
```
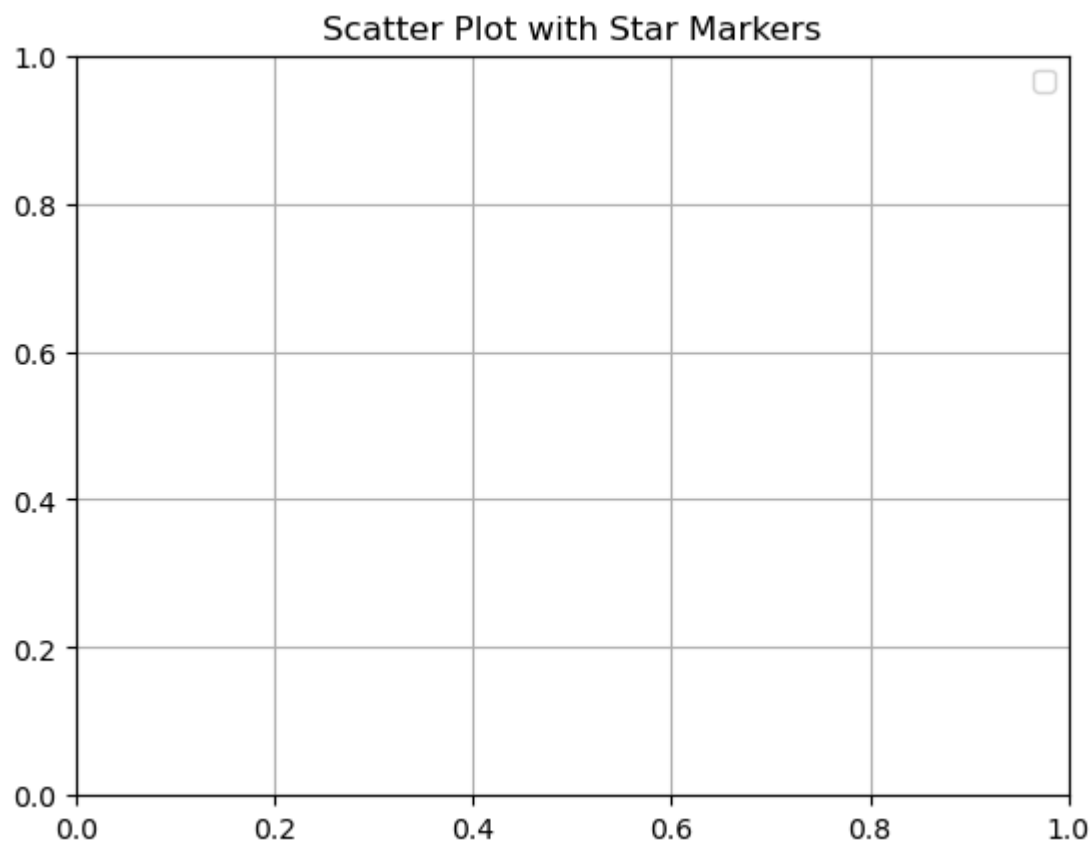
Out[147]: <matplotlib.collections.PathCollection at 0x1557dc35780>

In [148]:
```python
plt.xlabel('X Data Points')
plt.ylabel('Y Data Values')
```

Out[148]: Text(0, 0.5, 'Y Data Values')

In [149]:
```python
plt.title('Scatter Plot with Star Markers')
plt.legend()
plt.grid(True)
plt.show()
```

No artists with labels found to put in legend. Note that artists whose label start with an underscore are ignored when legend() is called with no argument.
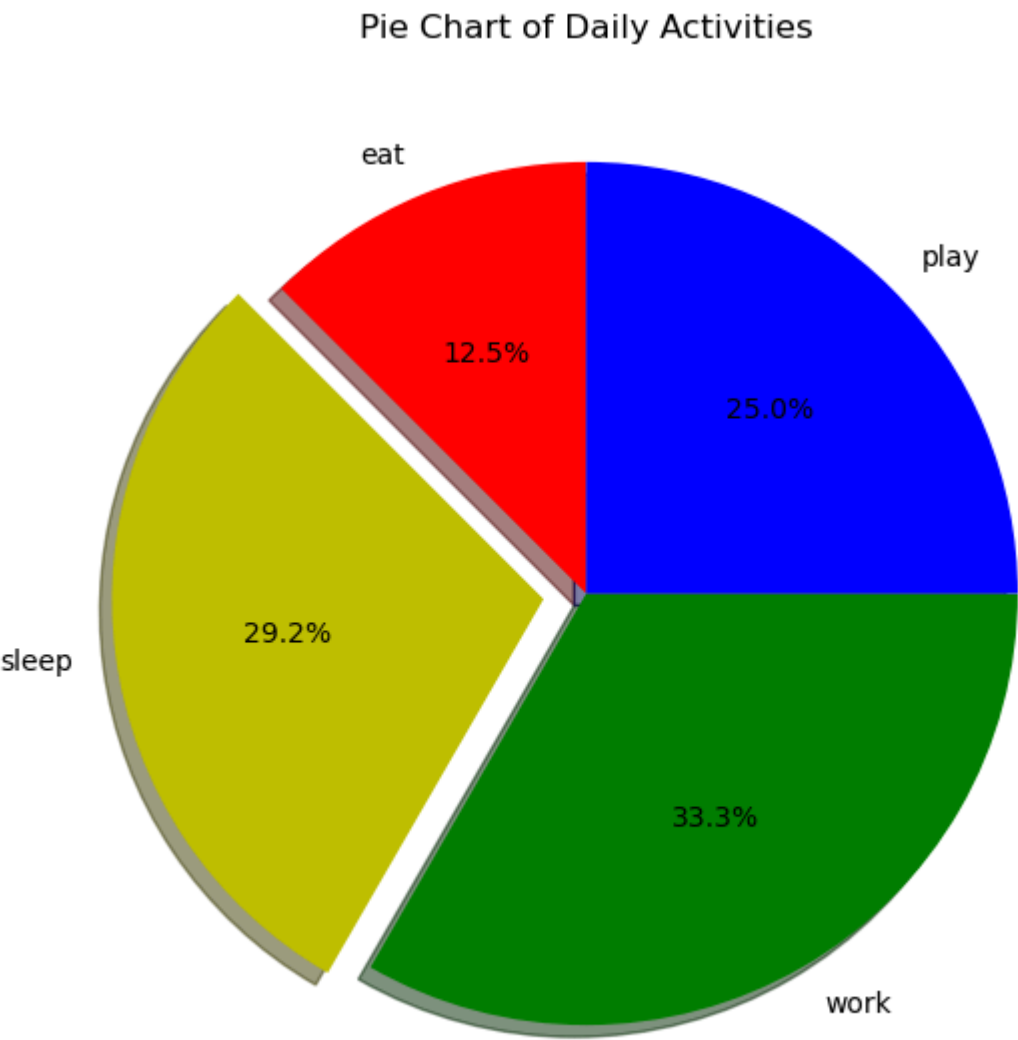

Pie-chart

In [150]:
```python
activities = ['eat', 'sleep', 'work', 'play']
slices = [3, 7, 8, 6]
colors = ['r', 'y', 'g', 'b']
```

In [151]:
```python
plt.figure(figsize=(7, 7))
explode = (0, 0.1, 0, 0)

plt.pie(
    slices,
    labels=activities,
    colors=colors,
    startangle=90,
    shadow=True,
    explode=explode,
    autopct='%1.1f%%'
)
plt.title('Pie Chart of Daily Activities')
plt.show()
```

Pie Chart of Daily Activities

In [ ]: