



دوره جامع پایتون:
بخش علوم داده
جلسه پانزدهم

دکتر ذبیح اله ذبیحی

```
import matplotlib.pyplot as plt
```

```
import numpy as np
```

```
x = np.random.randint(100, size=(100))
```

```
y = np.random.randint(100, size=(100))
```

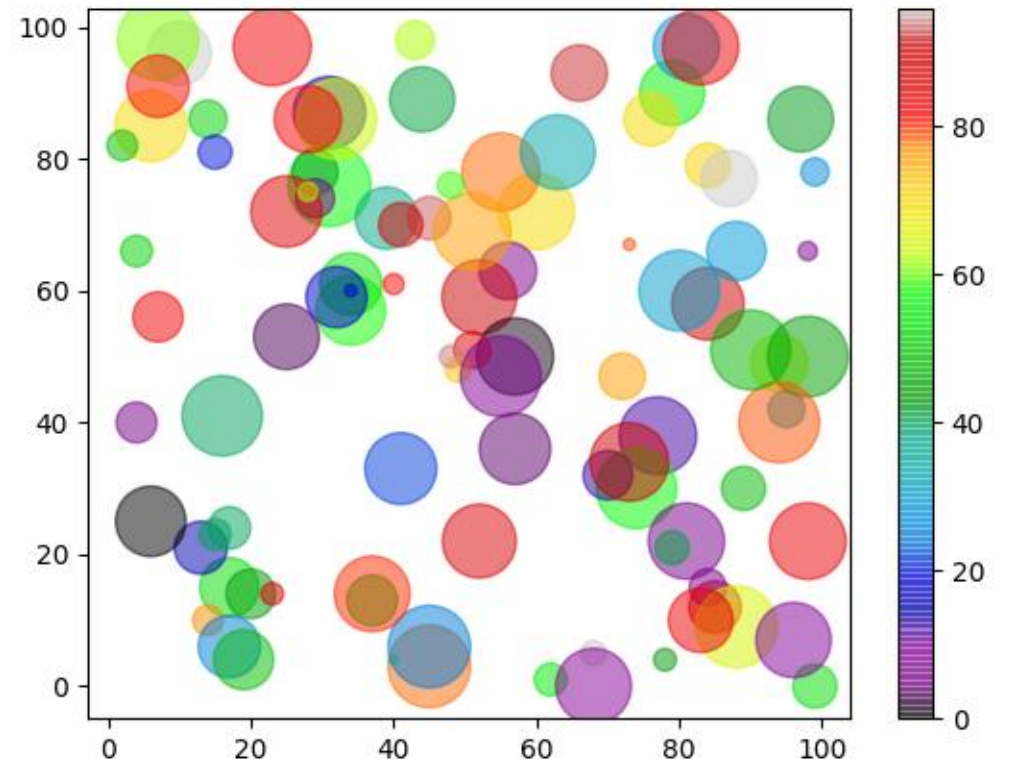
```
colors = np.random.randint(100, size=(100))
```

```
sizes = 10 * np.random.randint(100, size=(100))
```

```
plt.scatter(x, y, c=colors, s=sizes, alpha=0.5, cmap='nipy_spectral')
```

```
plt.colorbar()
```

```
plt.show()
```



```
import matplotlib.pyplot as plt
```

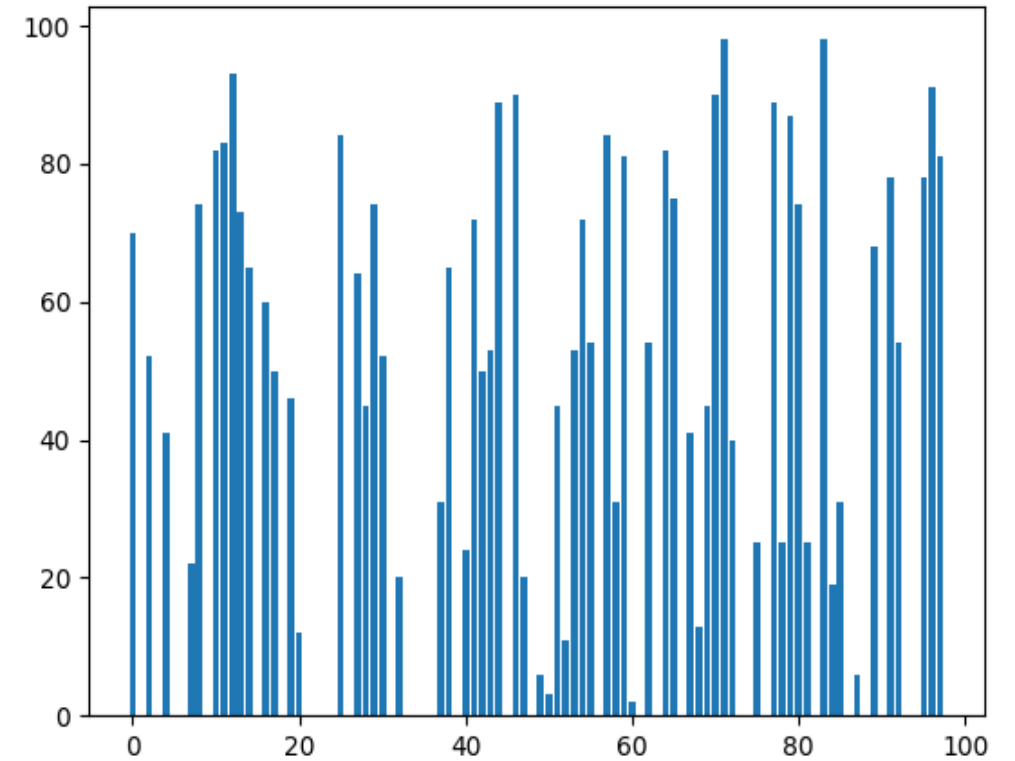
```
import numpy as np
```

```
x = np.random.randint(100, size=(100))
```

```
y = np.random.randint(100, size=(100))
```

```
plt.bar(x,y)
```

```
plt.show()
```



```
import matplotlib.pyplot as plt
```

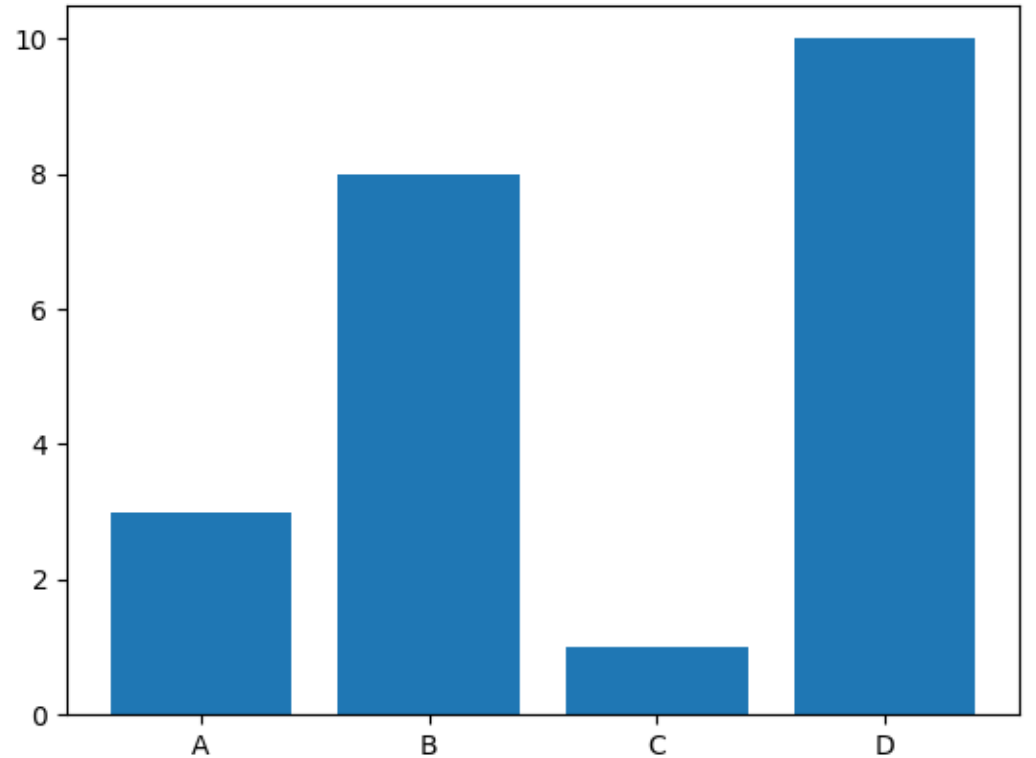
```
import numpy as np
```

```
x = np.array(["A", "B", "C", "D"])
```

```
y = np.array([3, 8, 1, 10])
```

```
plt.bar(x,y)
```

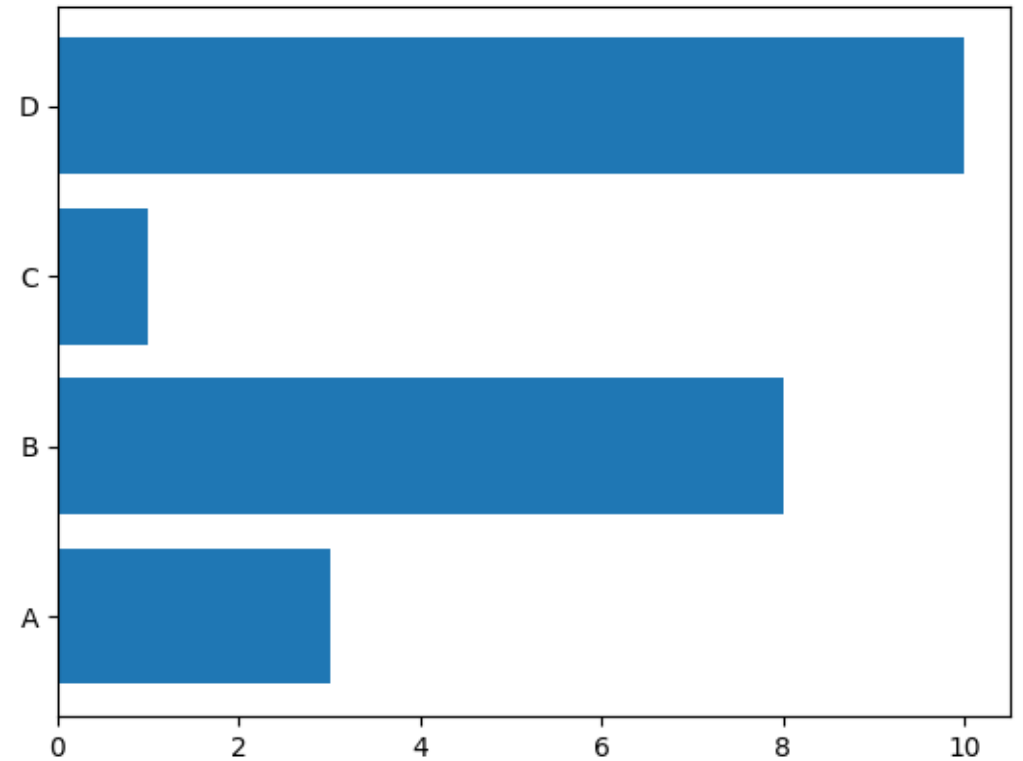
```
plt.show()
```



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

```
x = np.array(["A", "B", "C", "D"])  
y = np.array([3, 8, 1, 10])
```

```
plt.barh(x,y)  
plt.show()
```



```
import matplotlib.pyplot as plt
```

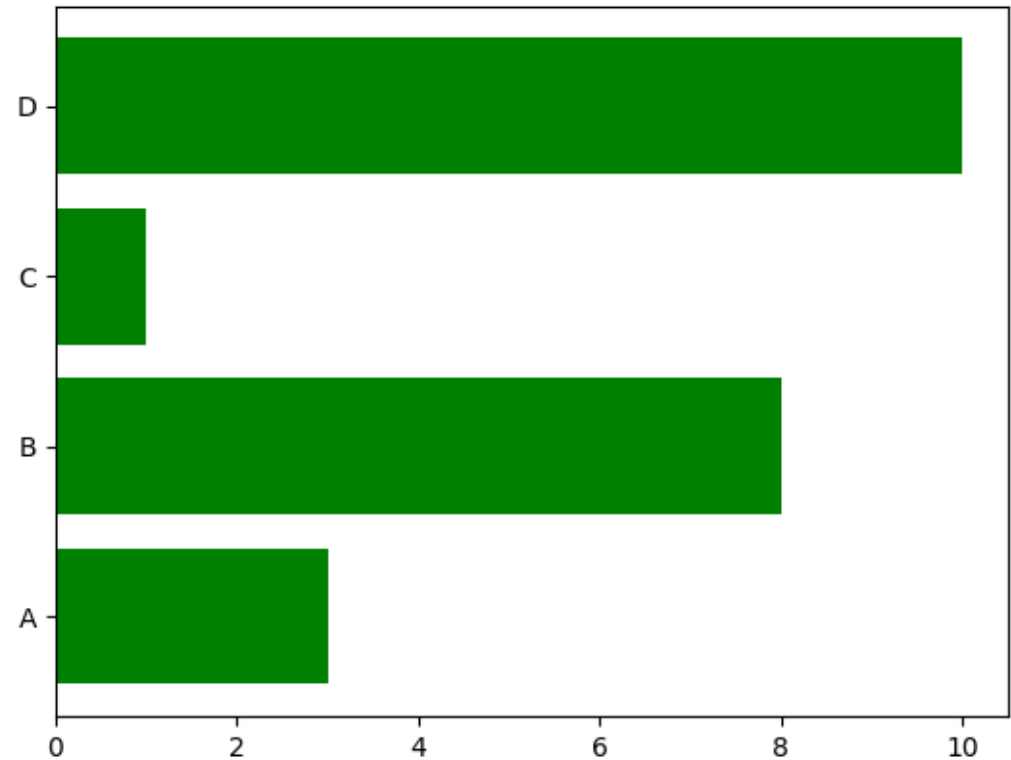
```
import numpy as np
```

```
x = np.array(["A", "B", "C", "D"])
```

```
y = np.array([3, 8, 1, 10])
```

```
plt.barh(x,y,color="green")
```

```
plt.show()
```



```
import matplotlib.pyplot as plt
```

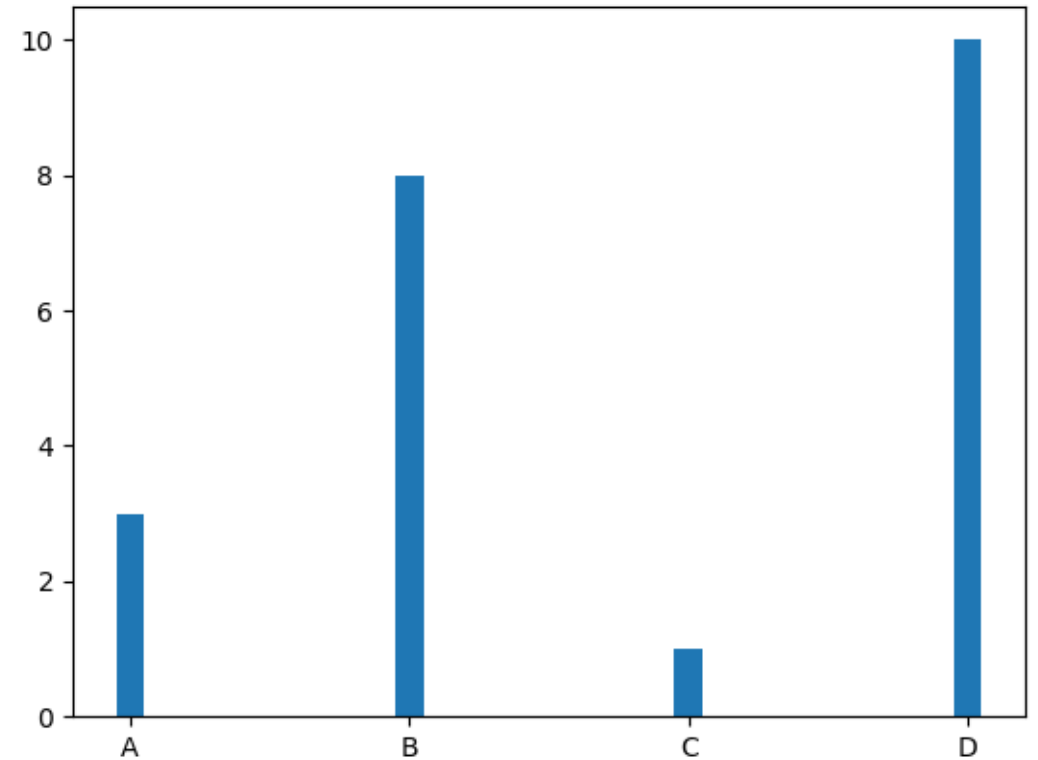
```
import numpy as np
```

```
x = np.array(["A", "B", "C", "D"])
```

```
y = np.array([3, 8, 1, 10])
```

```
plt.bar(x,y,width = 0.1)
```

```
plt.show()
```



```
import matplotlib.pyplot as plt
```

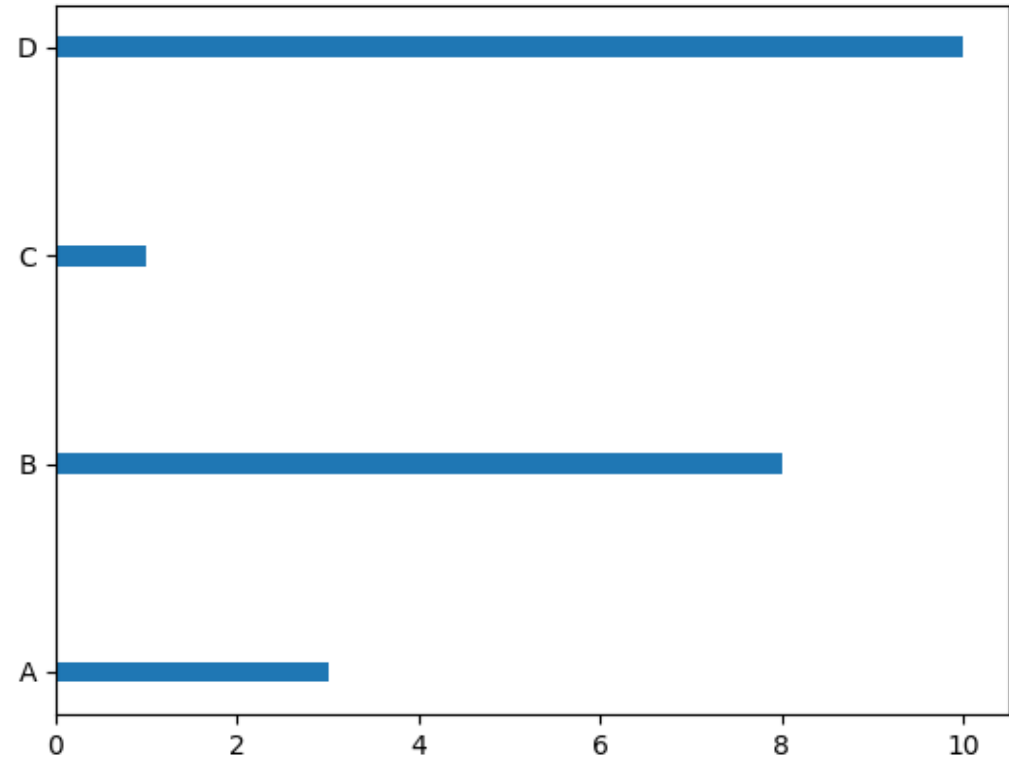
```
import numpy as np
```

```
x = np.array(["A", "B", "C", "D"])
```

```
y = np.array([3, 8, 1, 10])
```

```
plt.barh(x, y, height = 0.1)
```

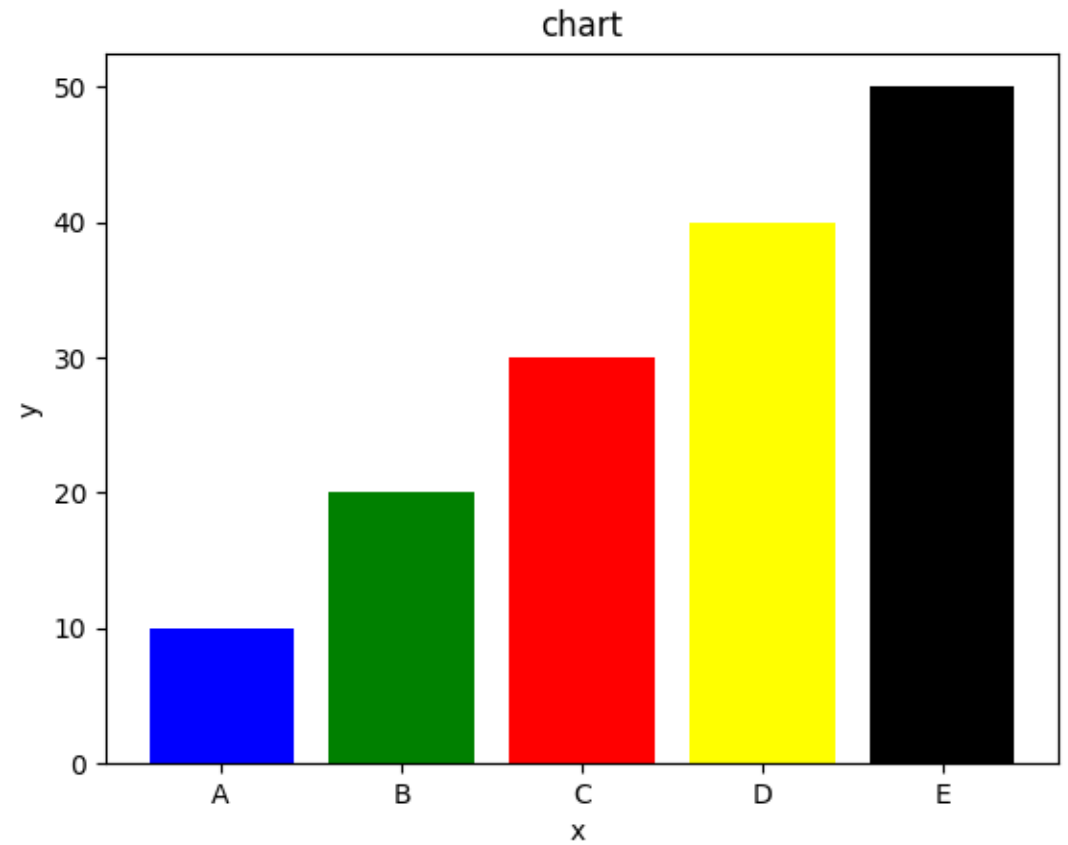
```
plt.show()
```




```
import matplotlib.pyplot as plt
x= [1, 2, 3, 4, 5]
y = [10, 20, 30, 40, 50]
tick_label = ['A', 'B', 'C', 'D', 'E']

plt.bar(x, y, tick_label = tick_label,
        width = 0.8, color = ['blue', 'green', 'red','yellow','black'])

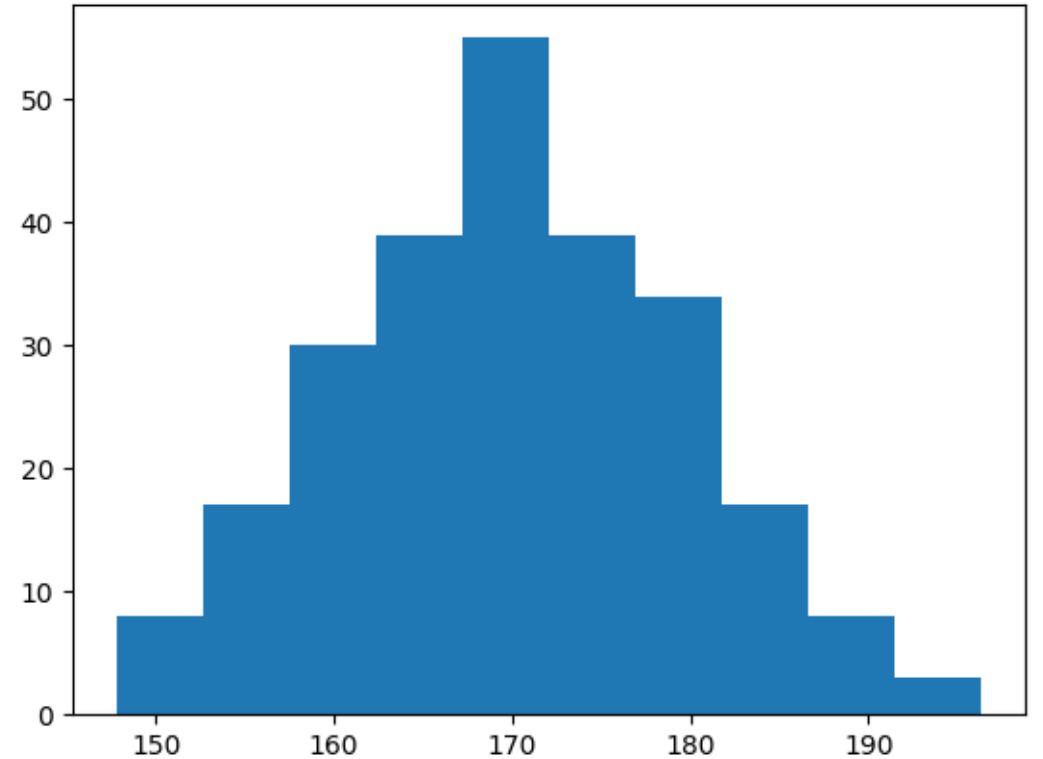
plt.xlabel('x ')
plt.ylabel('y')
plt.title('chart')
plt.show()
```



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

```
x = np.random.normal(170, 10, 250)
```

```
plt.hist(x)  
plt.show()
```



```
import matplotlib.pyplot as plt
```

```
import numpy as np
```

```
x = np.array([13, 35, 27, 25])
```

```
plt.pie(x)
```

```
plt.show()
```



```
import matplotlib.pyplot as plt
```

```
import numpy as np
```

```
x = np.array([13, 35, 27, 25])
```

```
myexplode = [0.2, 0, 0, 0]
```

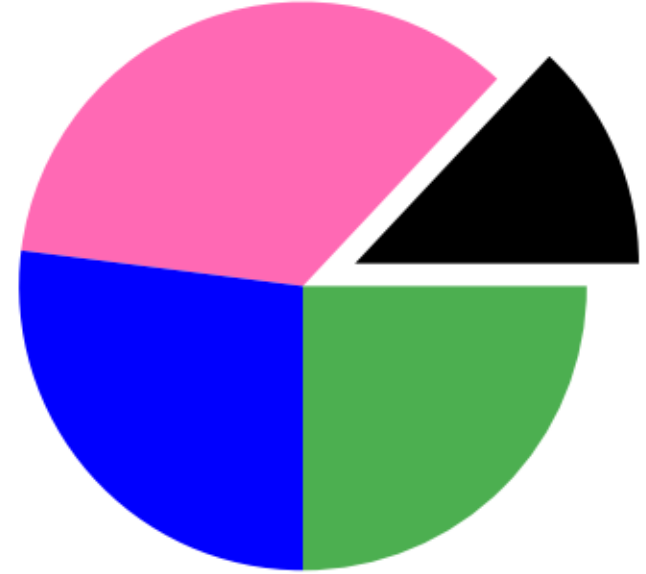
```
plt.pie(x,explode = myexplode )
```

```
plt.show()
```



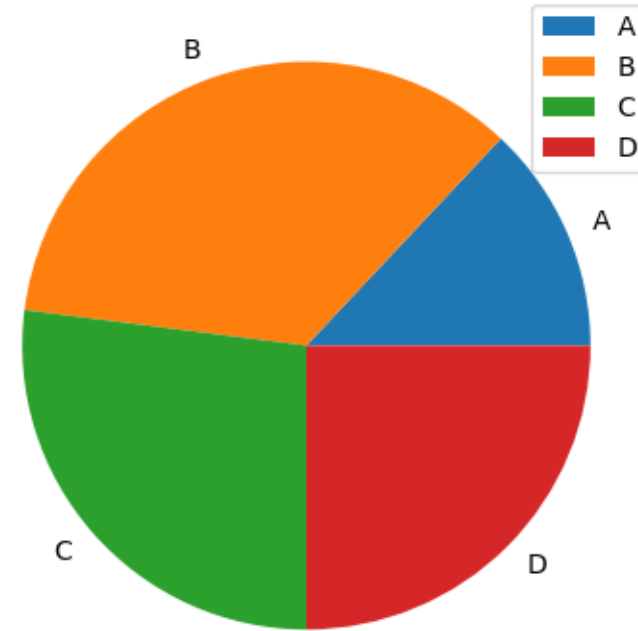
```
import matplotlib.pyplot as plt  
import numpy as np
```

```
x = np.array([13, 35, 27, 25])  
myexplode = [0.2, 0, 0, 0]  
mycolors = ["black", "hotpink", "b", "#4CAF50"]  
plt.pie(x,explode = myexplode,colors = mycolors )  
plt.show()
```



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

x = np.array([13, 35, 27, 25])
mylabels = ["A", "B", "C", "D"]
plt.pie(x, labels = mylabels)
plt.legend()
plt.show()
```

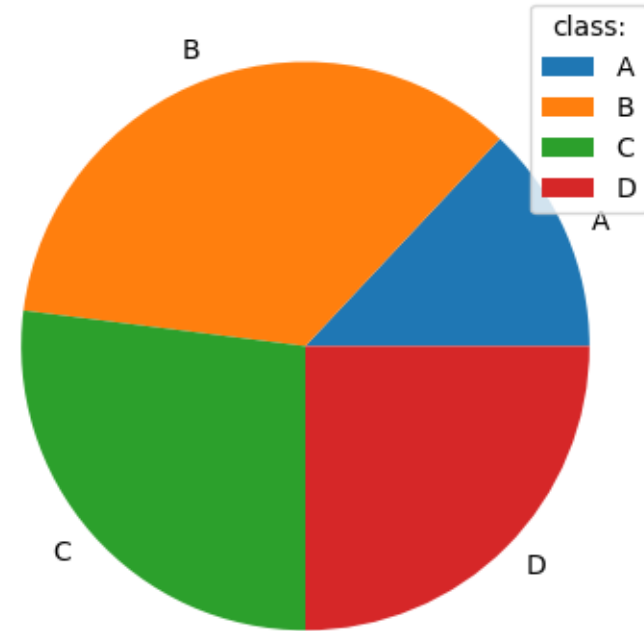


```
import matplotlib.pyplot as plt  
import numpy as np
```

```
x = np.array([13, 35, 27, 25])
```

```
mylabels = ["A", "B", "C", "D"]
```

```
plt.pie(x, labels = mylabels)  
plt.legend(title = "class:")  
plt.show()
```



```
import matplotlib.pyplot as plt
```

```
mylabel = ['a', 'b', 'c', 'd']
```

```
slices = [3, 7, 8, 6]
```

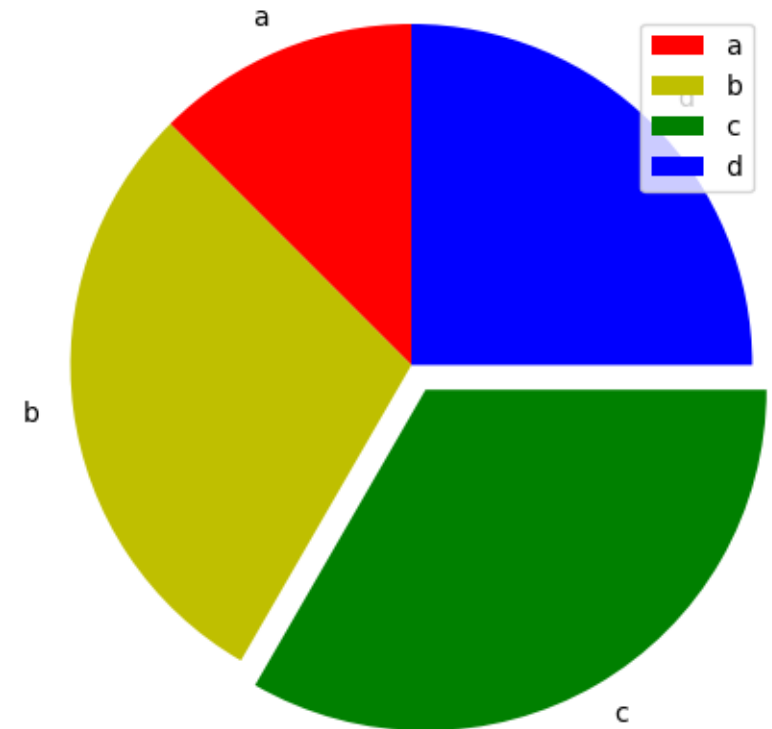
```
colors = ['r', 'y', 'g', 'b']
```

```
# plotting the pie chart
```

```
plt.pie(slices, labels = mylabel, colors=colors,  
        startangle=90, explode = (0, 0, 0.1, 0),  
        radius = 1.2)
```

```
plt.legend()
```

```
plt.show()
```




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

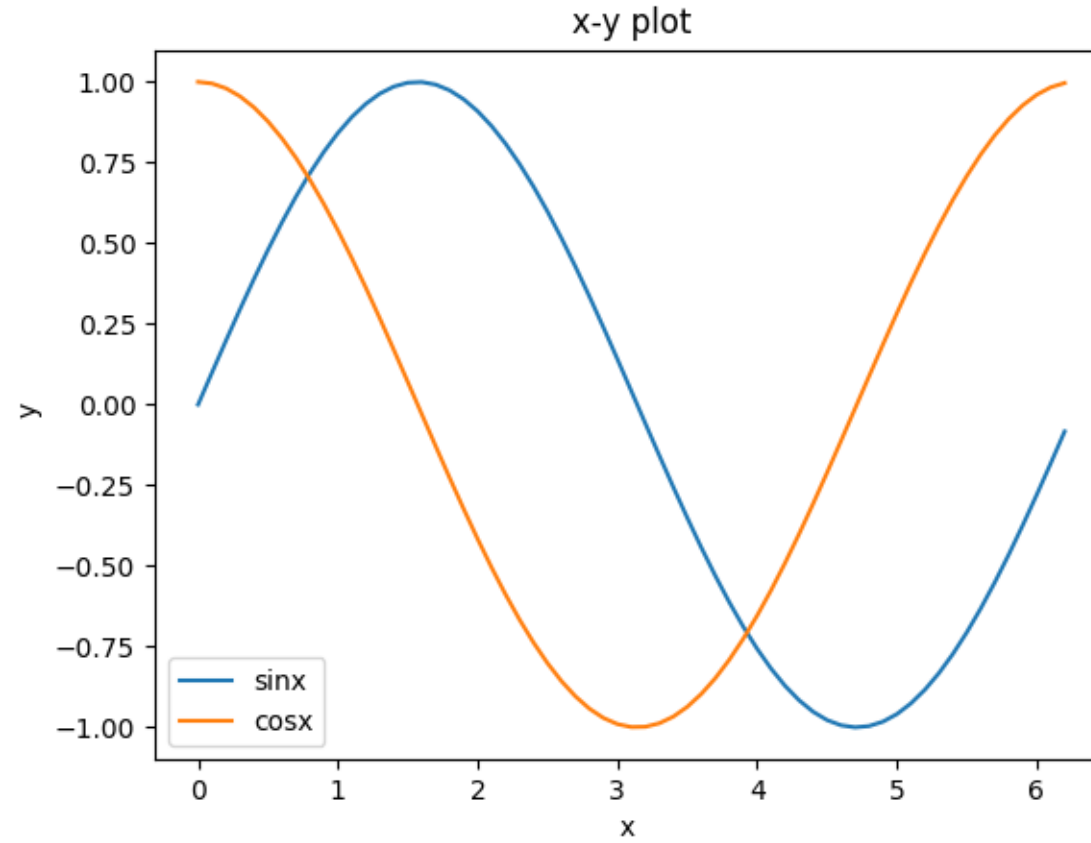
```
x = np.arange(0, 2*(np.pi), 0.1)
y1 = np.sin(x)
plt.plot(x, y1, label="sinx")
```

```
y2 = np.cos(x)
plt.plot(x, y2, label="cosx")
```

```
plt.xlabel('x ')
plt.ylabel('y ')
```

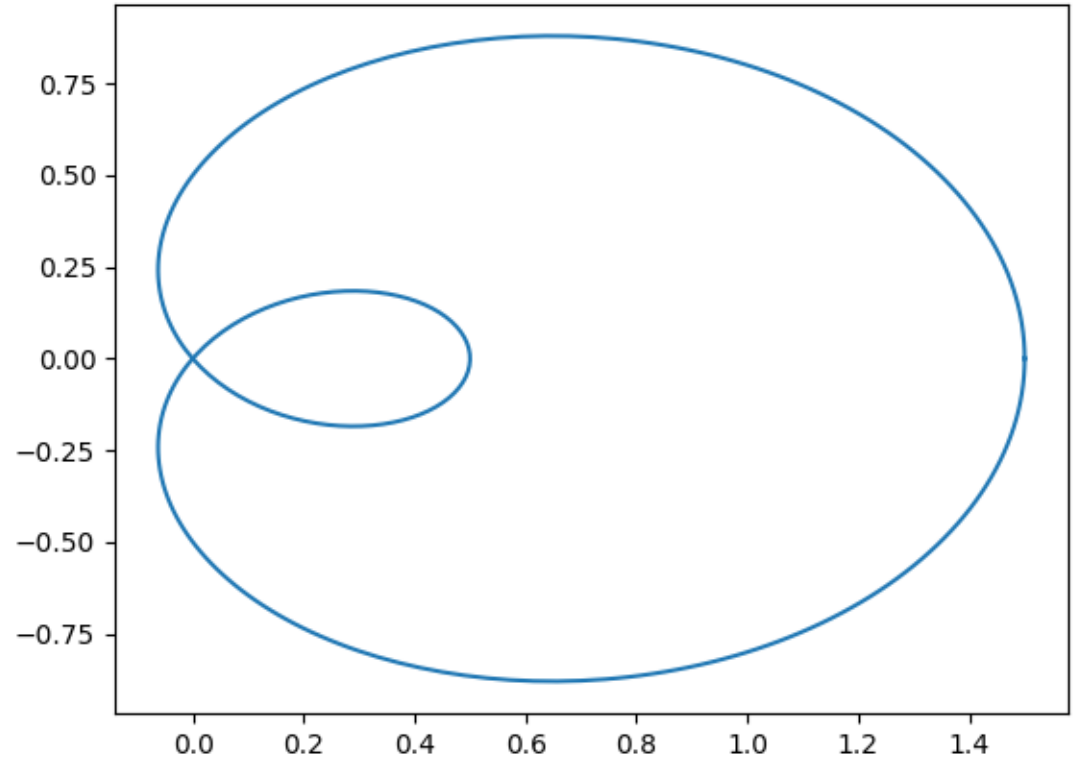
```
plt.title('x-y plot')
plt.legend()
```

```
plt.show()
```



- `Plt.plot(x,y)`
- `Plt.bar(x,y)`
- `Plt.hist(x,y)`
- `Plt.pie(y)`

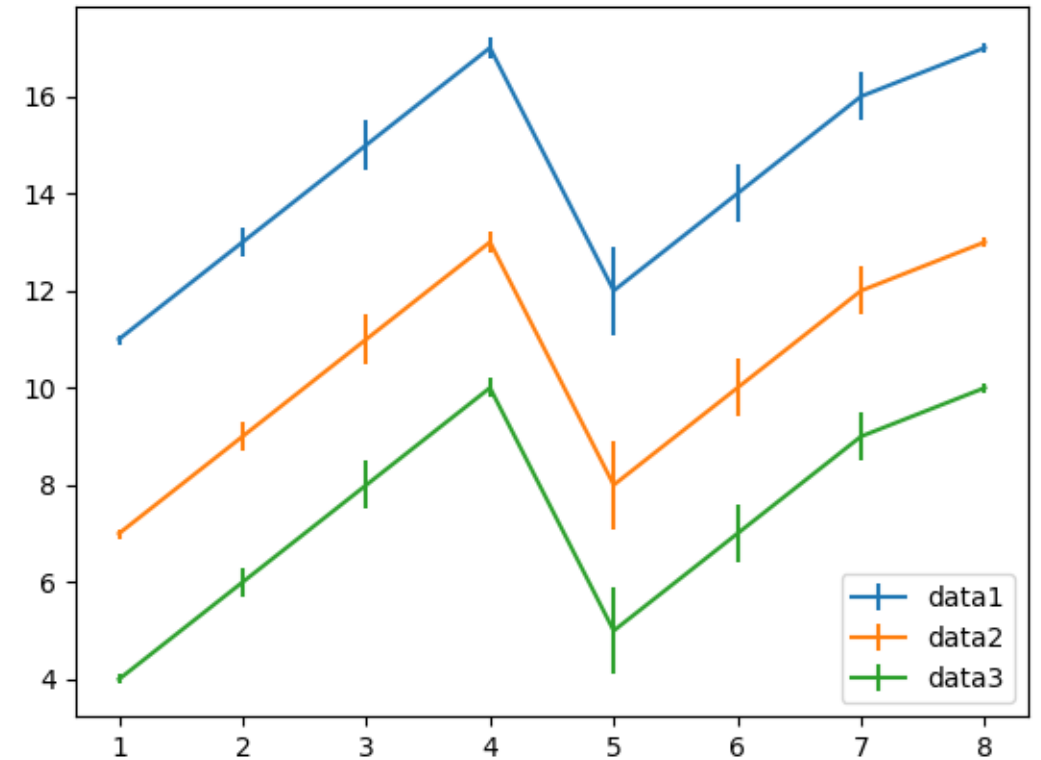
```
import numpy as np
import matplotlib.pyplot as plt
t = np.linspace(0, 2 * np.pi, 400)
r = 0.5 + np.cos(t)
x, y = r * np.cos(t), r * np.sin(t)
plt.plot(x, y)
plt.show()
```



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

```
x=np.array([1,2,3,4,5,6,7,8])
y=np.array([3,5,7,9,4,6,8,9])
```

```
yerr=np.array([0.1, 0.3,0.5,0.2,0.9,0.6,0.5,0.1])
plt.errorbar(x, y + 8, yerr=yerr, label='data1')
plt.errorbar(x, y + 4, yerr=yerr, label='data2')
plt.errorbar(x, y + 1, yerr=yerr,label='data3')
plt.legend(loc='lower right')
plt.show()
```



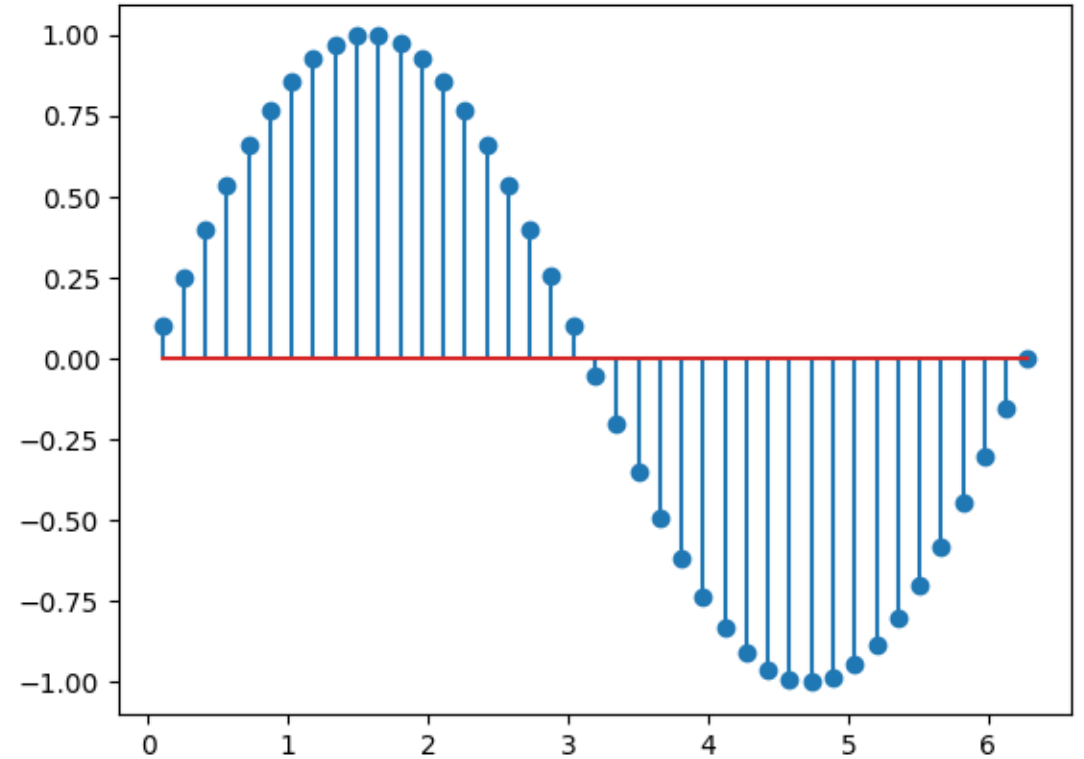
```
import matplotlib.pyplot as plt  
import numpy as np
```

```
x = np.linspace(0.1, 2 * np.pi, 41)
```

```
y = np.sin(x)
```

```
plt.stem(x, y)
```

```
plt.show()
```



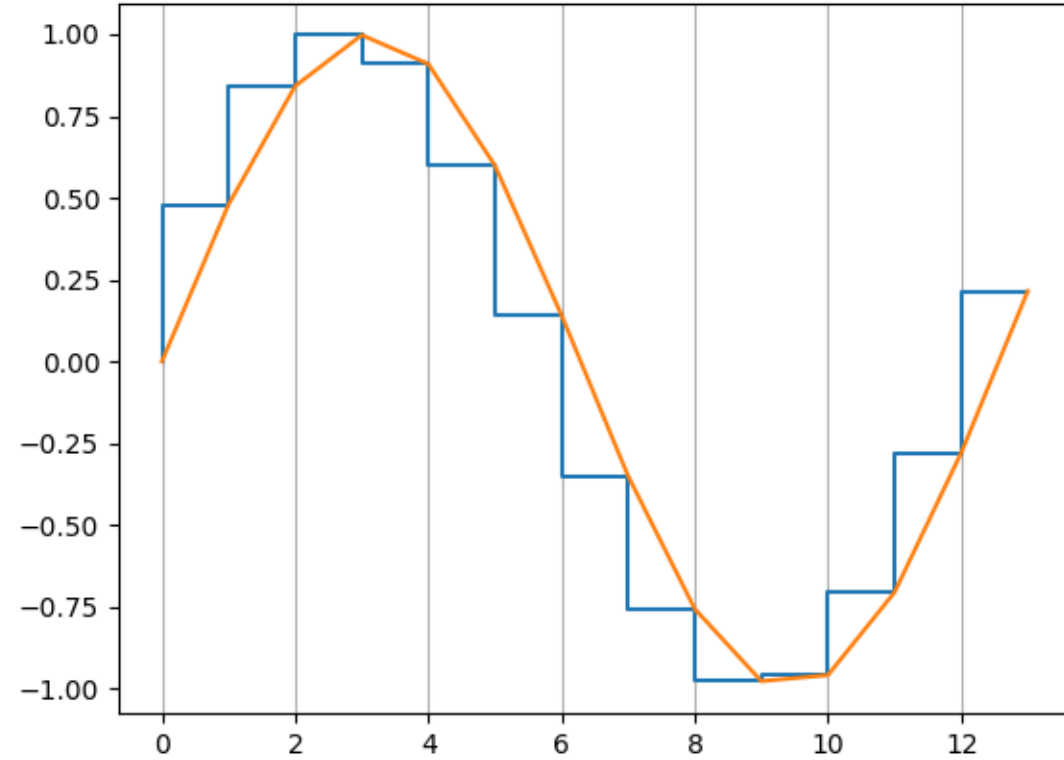
```
import numpy as np
import matplotlib.pyplot as plt
```

```
x = np.arange(14)
y = np.sin(x / 2)
```

```
plt.step(x, y)
plt.plot(x, y)
```

```
plt.grid(axis='x')
```

```
plt.show()
```



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

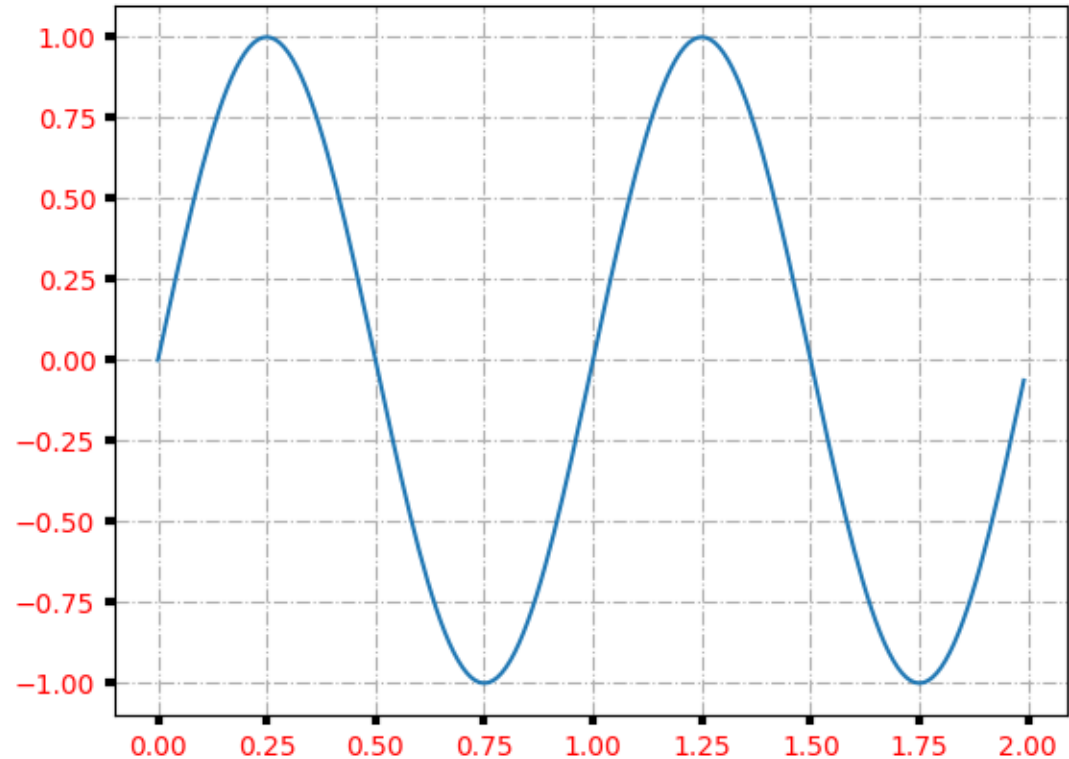
```
x = np.arange(0.0, 2.0, 0.01)  
y = np.sin(2 * np.pi * x)
```

```
plt.plot(x, y)
```

```
plt.grid( linestyle='-'. )
```

```
plt.tick_params(labelcolor='r', labelsiz='medium', width=3)
```

```
plt.show()
```



```
import matplotlib.pyplot as plt
```

```
import numpy as np
```

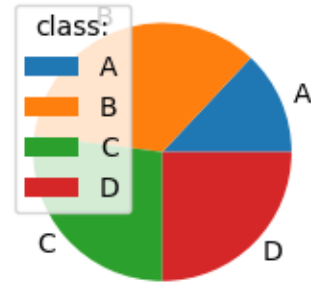
```
x = np.array([13, 35, 27, 25])
```

```
mylabels = ["A", "B", "C", "D"]
```

```
plt.subplot(2, 2, 1)
```

```
plt.pie(x, labels = mylabels)
```

```
plt.legend(title = "class:")
```

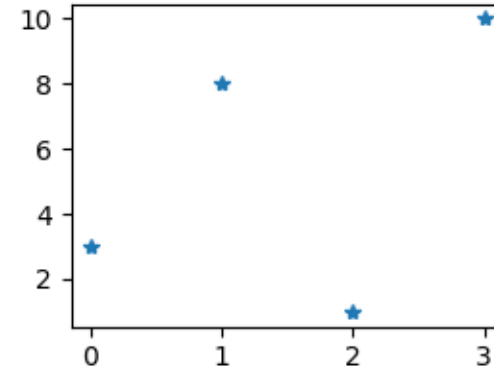


```
x = np.array([0, 1, 2, 3])
```

```
y = np.array([3, 8, 1, 10])
```

```
plt.subplot(2, 2, 2)
```

```
plt.plot(x,y,"*")
```

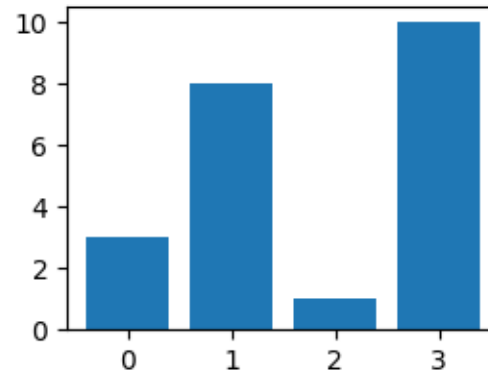


```
x = np.array([0, 1, 2, 3])
```

```
y = np.array([3, 8, 1, 10])
```

```
plt.subplot(2, 2, 3)
```

```
plt.bar(x,y)
```

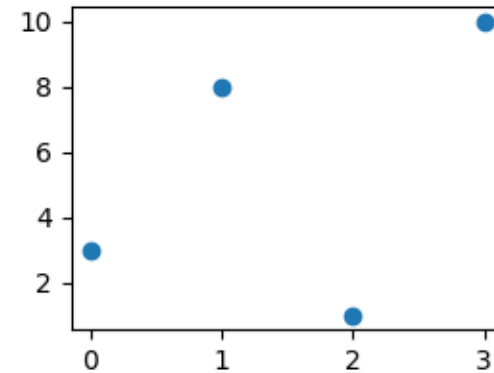


```
x = np.array([0, 1, 2, 3])
```

```
y = np.array([3, 8, 1, 10])
```

```
plt.subplot(2, 2, 4)
```

```
plt.scatter(x,y)
```



```
plt.show()
```



```

import matplotlib.pyplot as plt

import numpy as np

x = np.arange(-10, 10, 0.01)

y = x

plt.subplot(2, 2, 1)

plt.plot(x, y)

plt.xlabel('x ')

plt.ylabel('y ')

y = x**3

plt.subplot(2, 2, 2)

plt.plot(x,y,"*")

plt.xlabel('x ')

plt.ylabel('y ')

y = np.exp(-x)

plt.subplot(2, 2, 3)

plt.plot(x,y)

plt.xlabel('x ')

plt.ylabel('y ')

x = np.array([13, 35, 27, 25])

mylabels = ["A", "B", "C", "D"]

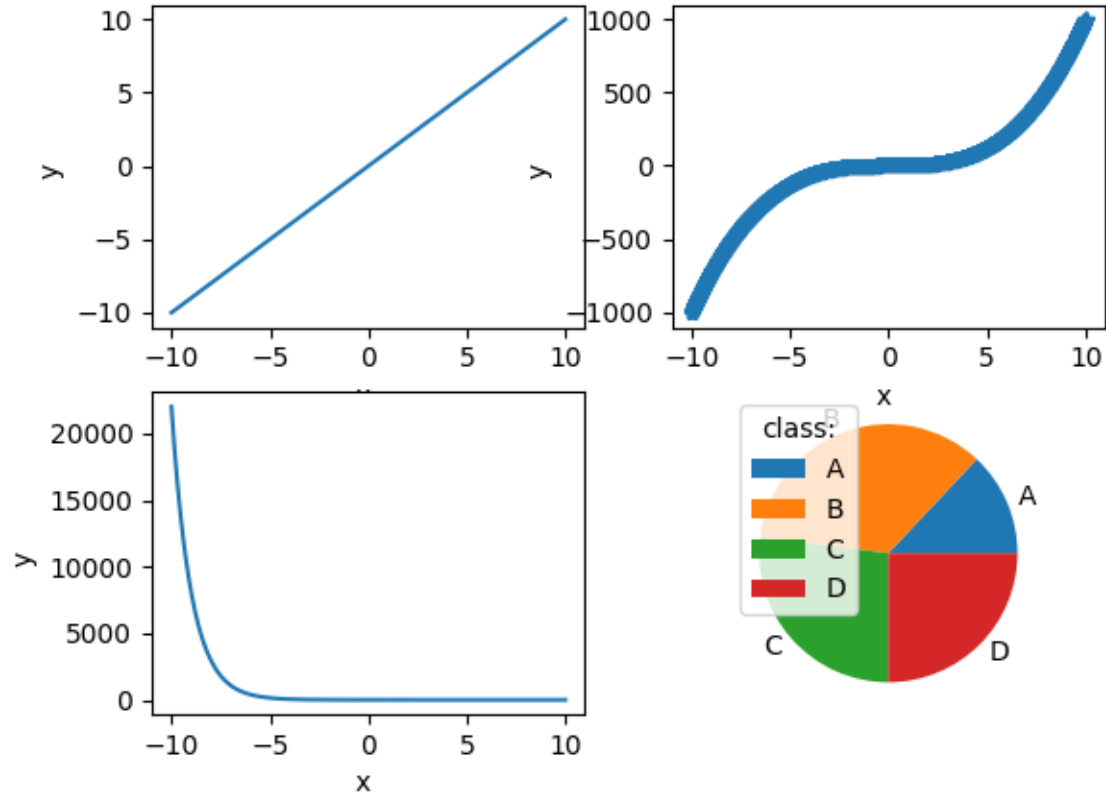
plt.subplot(2, 2, 4)

plt.pie(x, labels = mylabels)

plt.legend(title = "class:")

plt.show()

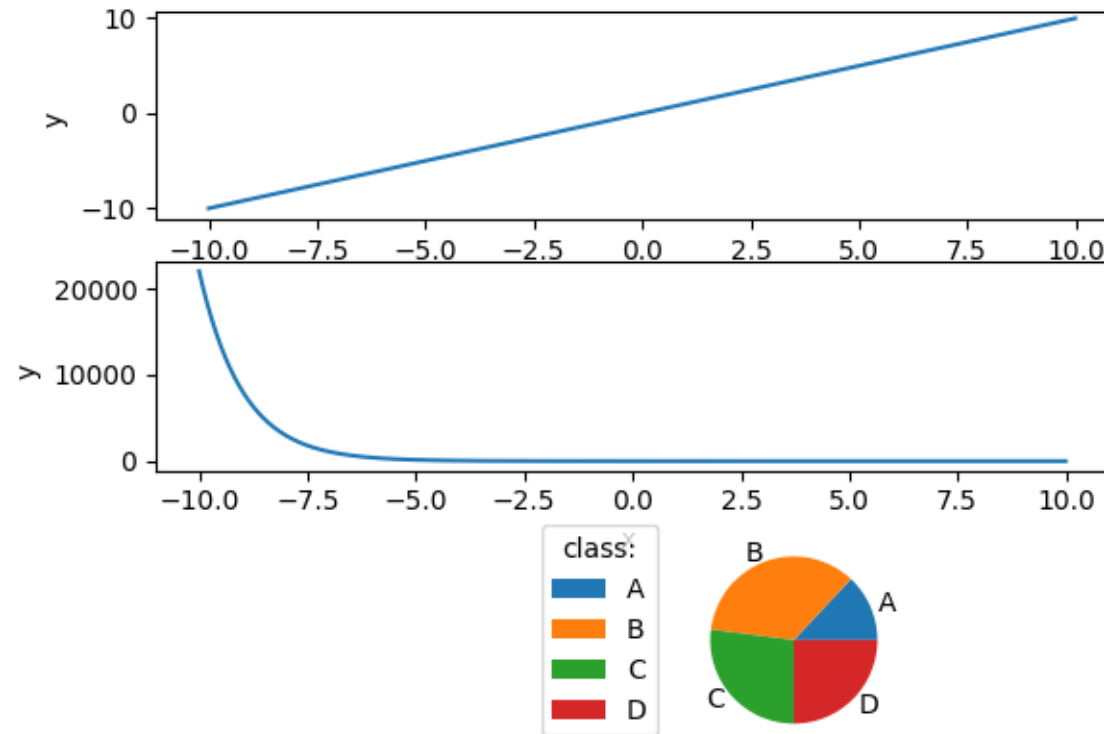
```



```
import matplotlib.pyplot as plt
import numpy as np
x = np.arange(-10, 10, 0.01)
y = x
plt.subplot(3, 1, 1)
plt.plot(x, y)
plt.xlabel('x ')
plt.ylabel('y ')
```

```
y = np.exp(-x)
plt.subplot(3, 1, 2)
plt.plot(x, y)
plt.xlabel('x ')
plt.ylabel('y ')
```

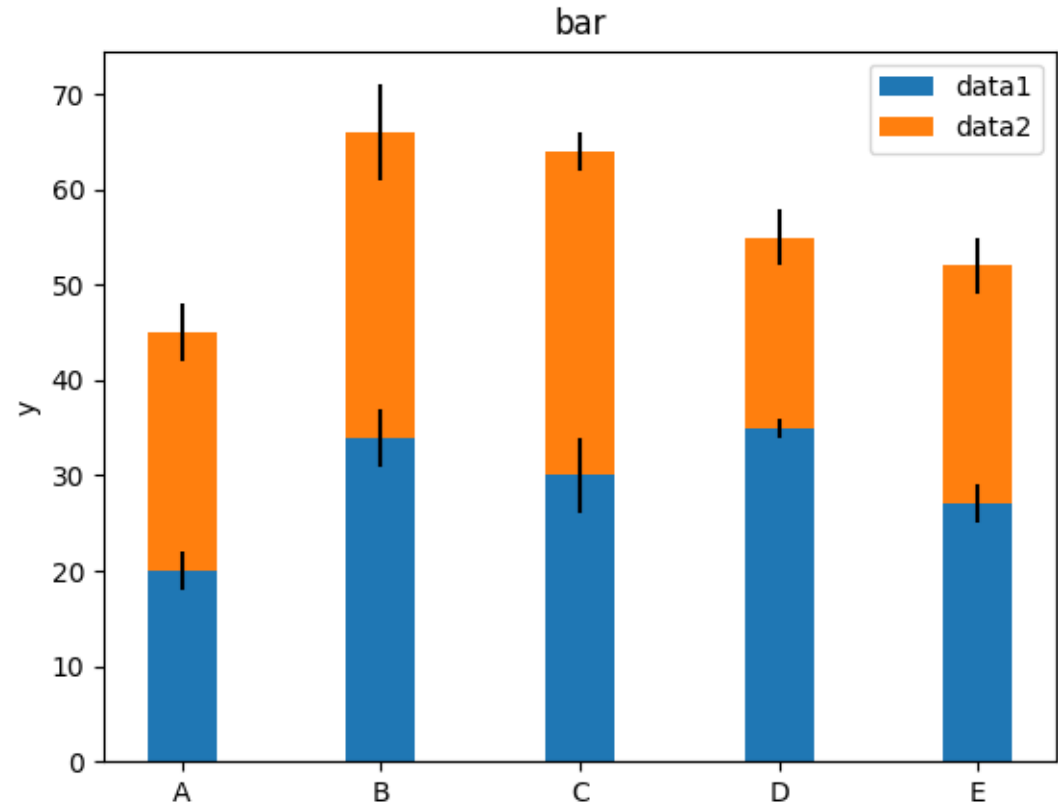
```
x = np.array([13, 35, 27, 25])
mylabels = ["A", "B", "C", "D"]
plt.subplot(3, 1, 3)
plt.pie(x, labels = mylabels)
plt.legend(title = "class:")
plt.show()
```



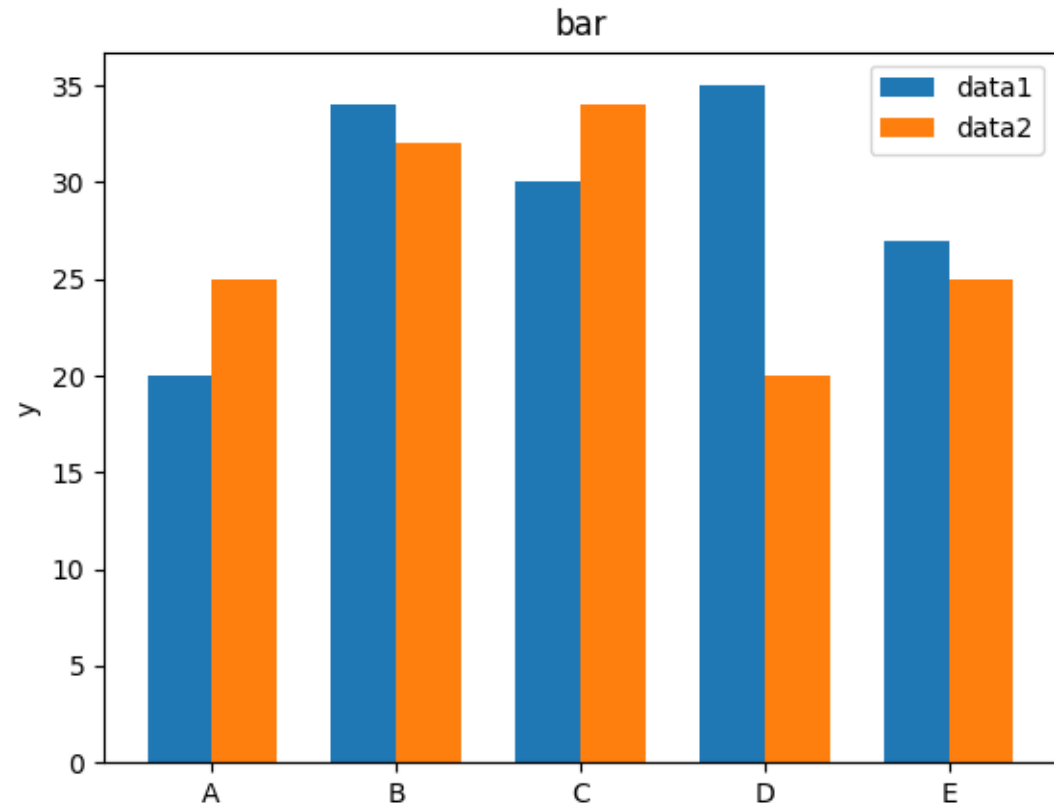
```

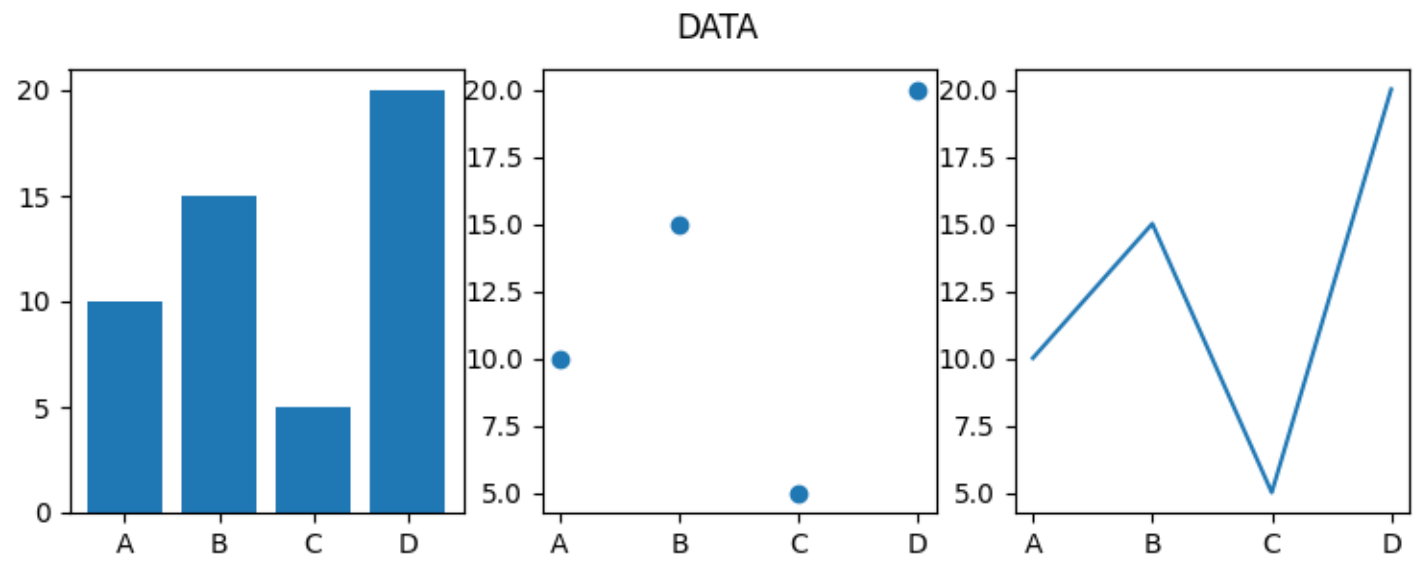
import matplotlib.pyplot as plt
import numpy as np
labels = ['A', 'B', 'C', 'D', 'E']
data1 = [20, 34, 30, 35, 27]
data2 = [25, 32, 34, 20, 25]
data1_std = [2, 3, 4, 1, 2]
data2_std = [3, 5, 2, 3, 3]
width = 0.35
fig, ax = plt.subplots()
ax.bar(labels, data1, width, yerr=data1_std, label='data1')
ax.bar(labels, data2, width, yerr=data2_std, bottom=data1,
       label='data2')
ax.set_ylabel('y')
ax.set_title('bar')
ax.legend()
plt.show()

```



```
import matplotlib.pyplot as plt
import numpy as np
labels = ['A', 'B', 'C', 'D', 'E']
data1 = [20, 34, 30, 35, 27]
data2 = [25, 32, 34, 20, 25]
x = np.arange(len(labels))
width = 0.35
fig, ax = plt.subplots()
ax.bar(x - width/2, data1, width, label='data1')
ax.bar(x + width/2, data2, width, label='data2')
ax.set_ylabel('y')
ax.set_title('bar')
ax.set_xticks(x)
ax.set_xticklabels(labels)
ax.legend()
plt.show()
```





```
import matplotlib.pyplot as plt
```

```
data = {'A': 10, 'B': 15, 'C': 5, 'D': 20}
```

```
x = list(data.keys())
```

```
y = list(data.values())
```

```
fig, axs = plt.subplots(1, 3, figsize=(9, 3))
```

```
axs[0].bar(x, y)
```

```
axs[1].scatter(x, y)
```

```
axs[2].plot(x, y)
```

```
fig.suptitle('DATA')
```

```
plt.show()
```

```

import numpy as np
import matplotlib.pyplot as plt

# Create some mock data
t = np.arange(0.01, 10.0, 0.01)
data1 = np.exp(t)
data2 = np.sin(2 * np.pi * t)

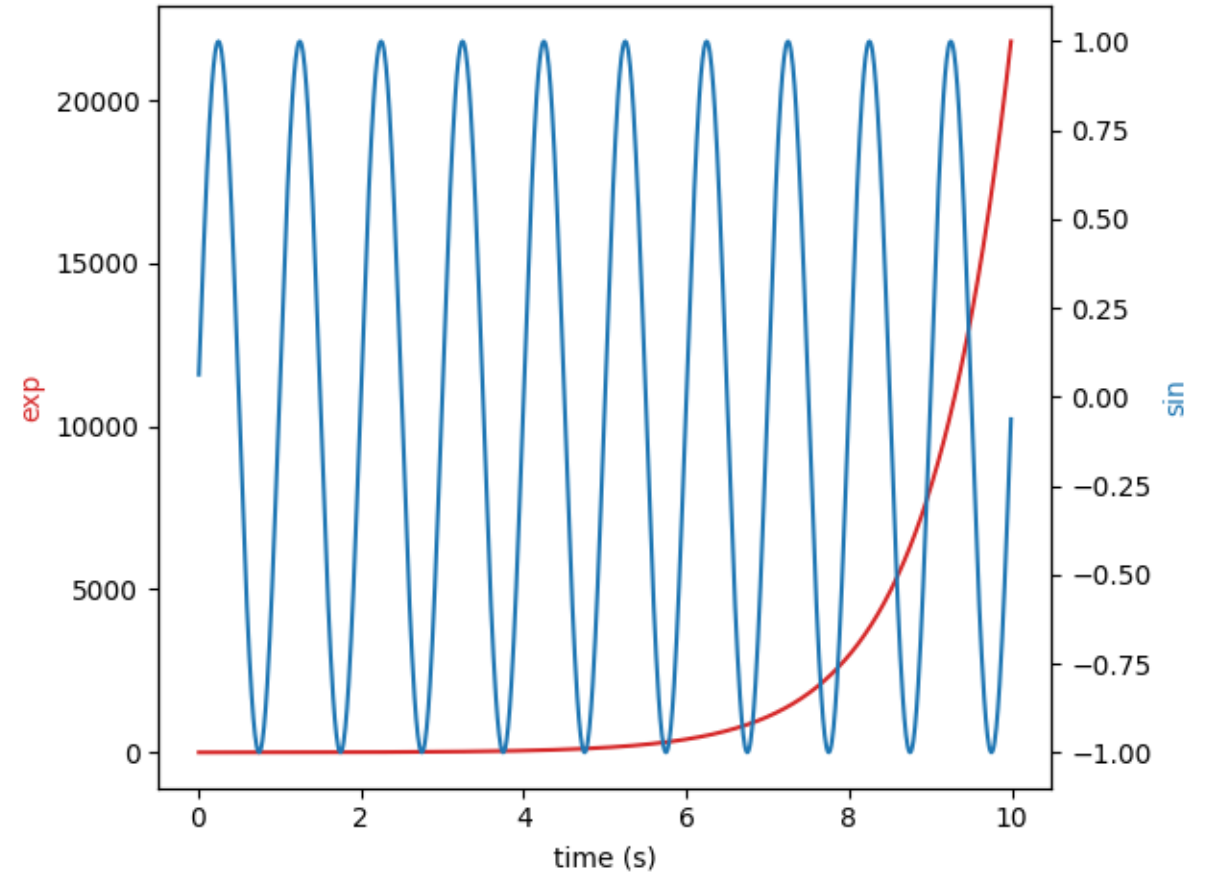
fig, ax1 = plt.subplots()

color = 'tab:red'
ax1.set_xlabel('time (s)')
ax1.set_ylabel('exp', color=color)
ax1.plot(t, data1, color=color)

ax2 = ax1.twinx()
color = 'tab:blue'
ax2.set_ylabel('sin', color=color)
ax2.plot(t, data2, color=color)

fig.tight_layout() plt.show()

```



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

```
r = np.arange(0, 2, 0.01)
```

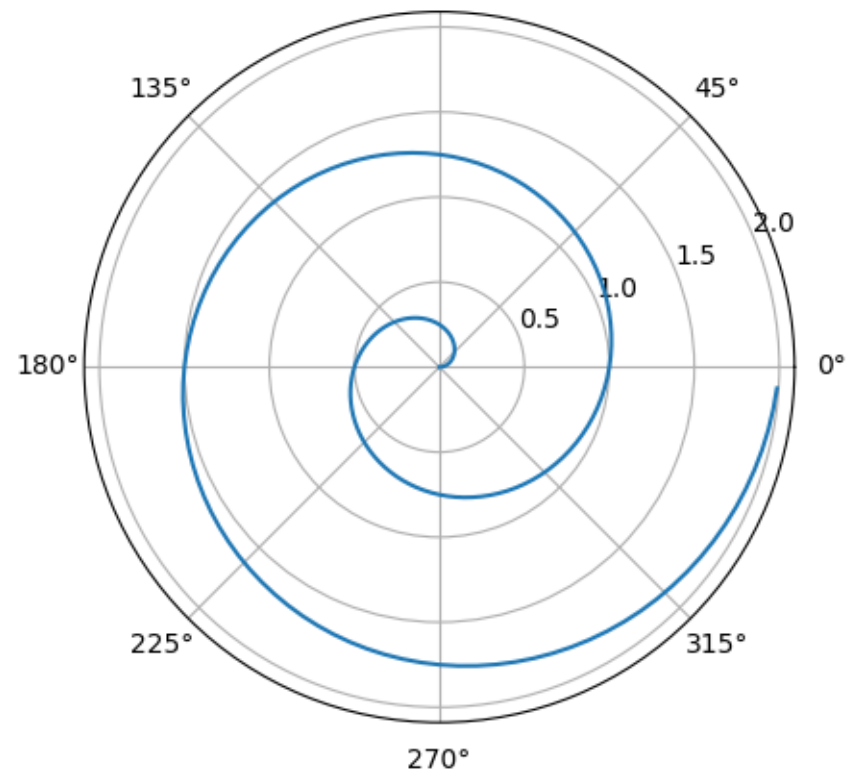
```
theta = 2 * np.pi * r
```

```
fig, ax = plt.subplots(subplot_kw={'projection': 'polar'})
```

```
ax.plot(theta, r)
```

```
ax.set_rticks([0.5, 1, 1.5, 2])
```

```
plt.show()
```

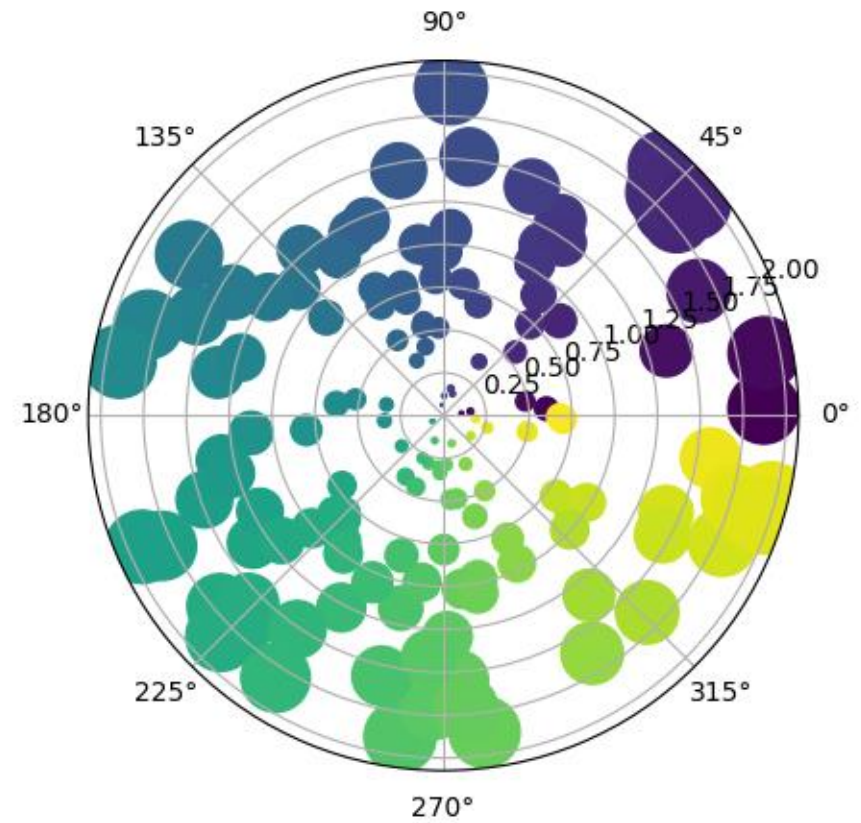


```
import numpy as np
import matplotlib.pyplot as plt
```

```
N = 150
r = 2 * np.random.rand(N)
theta = 2 * np.pi * np.random.rand(N)
area = 200 * r**2
colors = theta
```

```
fig = plt.figure()
ax = fig.add_subplot( projection='polar')
ax.scatter(theta, r, c=colors, s=area)
```

```
plt.show()
```

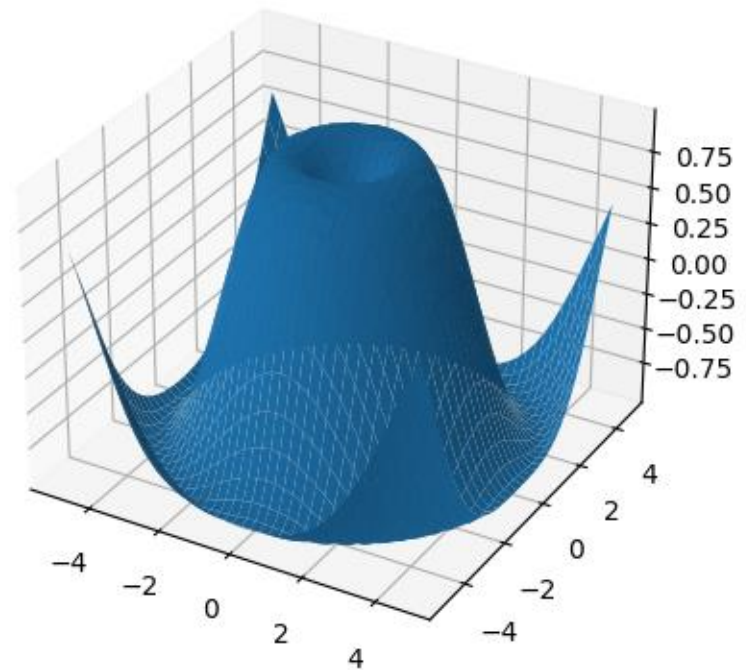



```
import matplotlib.pyplot as plt
import numpy as np
```

```
fig = plt.figure()
ax = plt.axes(projection='3d')
X = np.arange(-5, 5, 0.25)
Y = np.arange(-5, 5, 0.25)
X, Y = np.meshgrid(X, Y)
R = np.sqrt(X**2 + Y**2)
Z = np.sin(R)
```

```
surf = ax.plot_surface(X, Y, Z)
```

```
plt.show()
```



کتابخانه های دیگر برای رسم و مصور سازی

- **seaborn**
- **ggplot**
- **Bokeh**
- **pygal**
- **plotly**
- **geoplotlib**
- **Gleam**
- **missingno**
- **Leather**