Matplotlib ile grafik çizimi
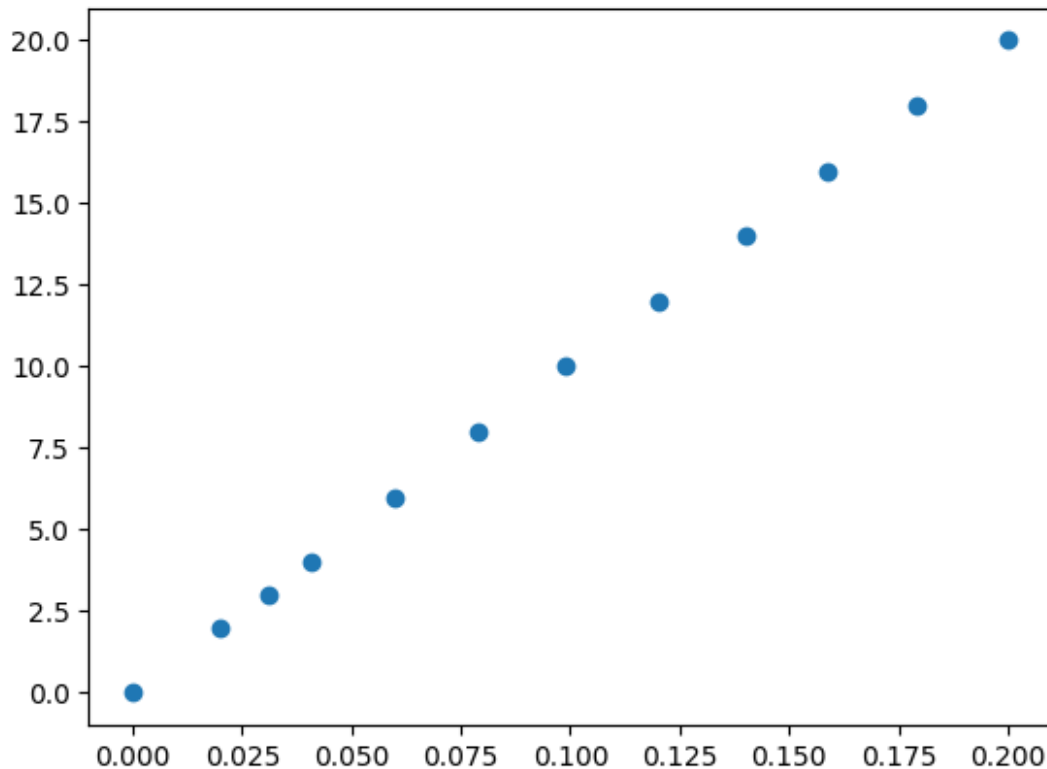
```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

print("numpy version:", np.__version__)
print("pandas version:", pd.__version__)
```

```
numpy version: 1.26.4
pandas version: 2.1.4
```
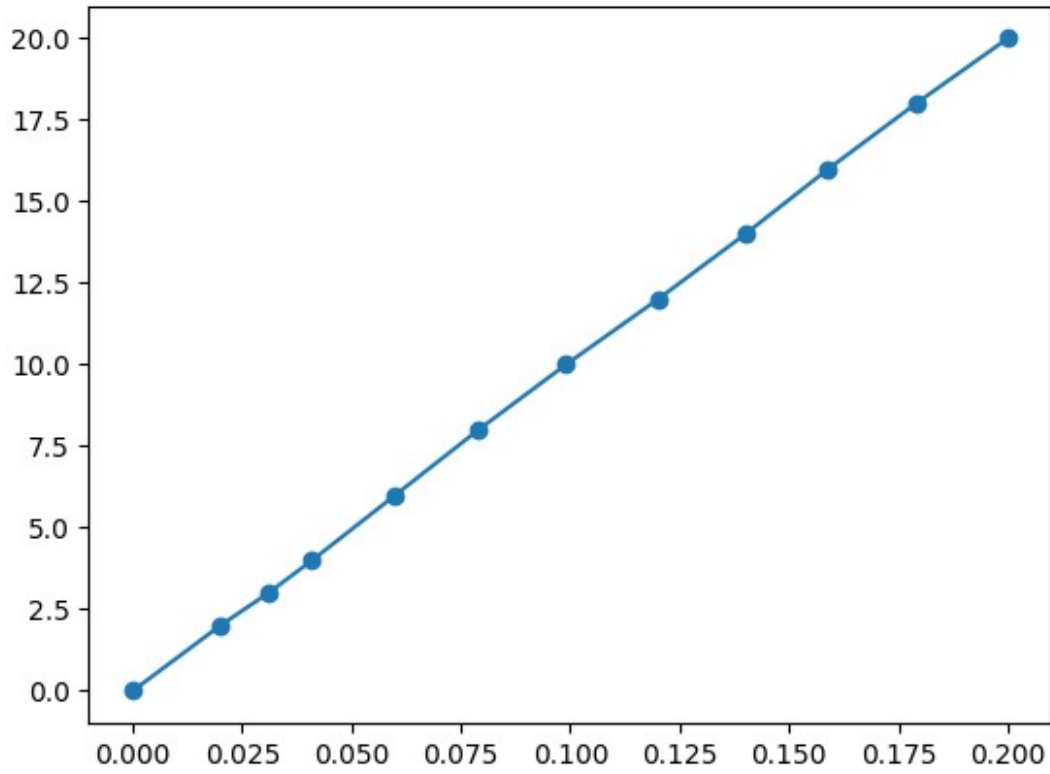
```python
V = [0, 2, 3, 4, 6, 8, 10, 12, 14, 16, 18, 20]
I = [0 , 0.02, 0.031, 0.041, 0.06, 0.079, 0.099, 0.12, 0.14, 0.159,
0.179, 0.2]

plt.scatter(I, V)
plt.show()
```
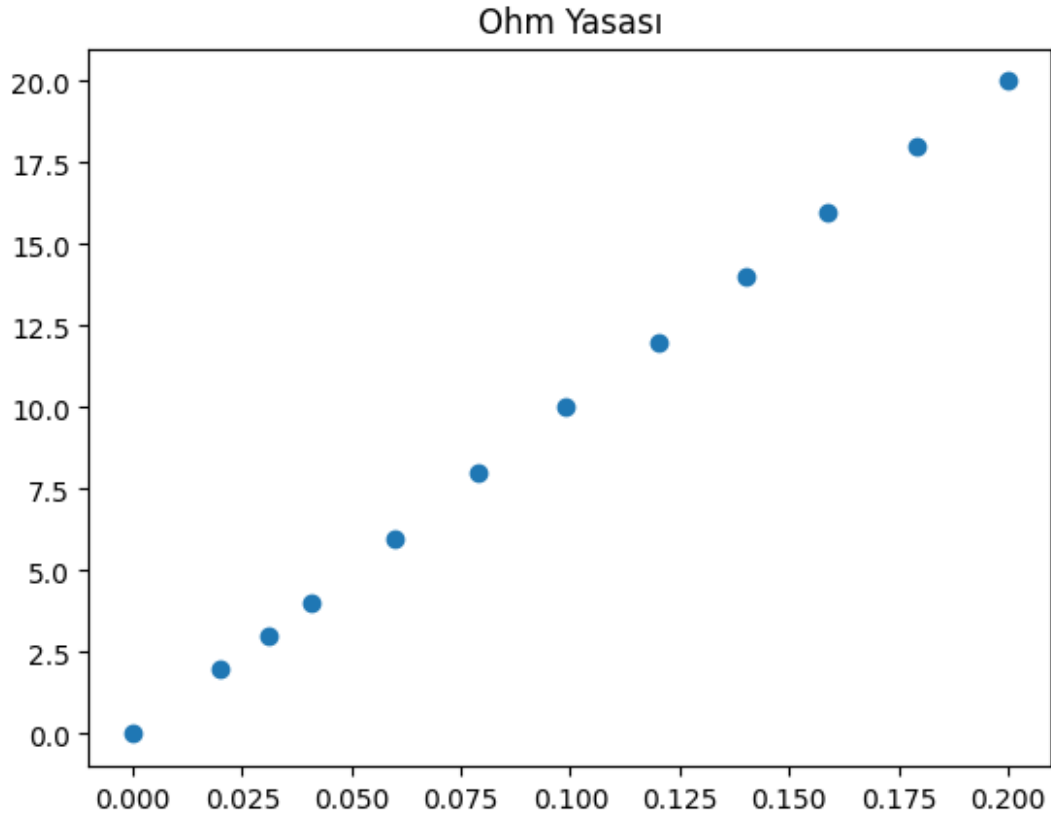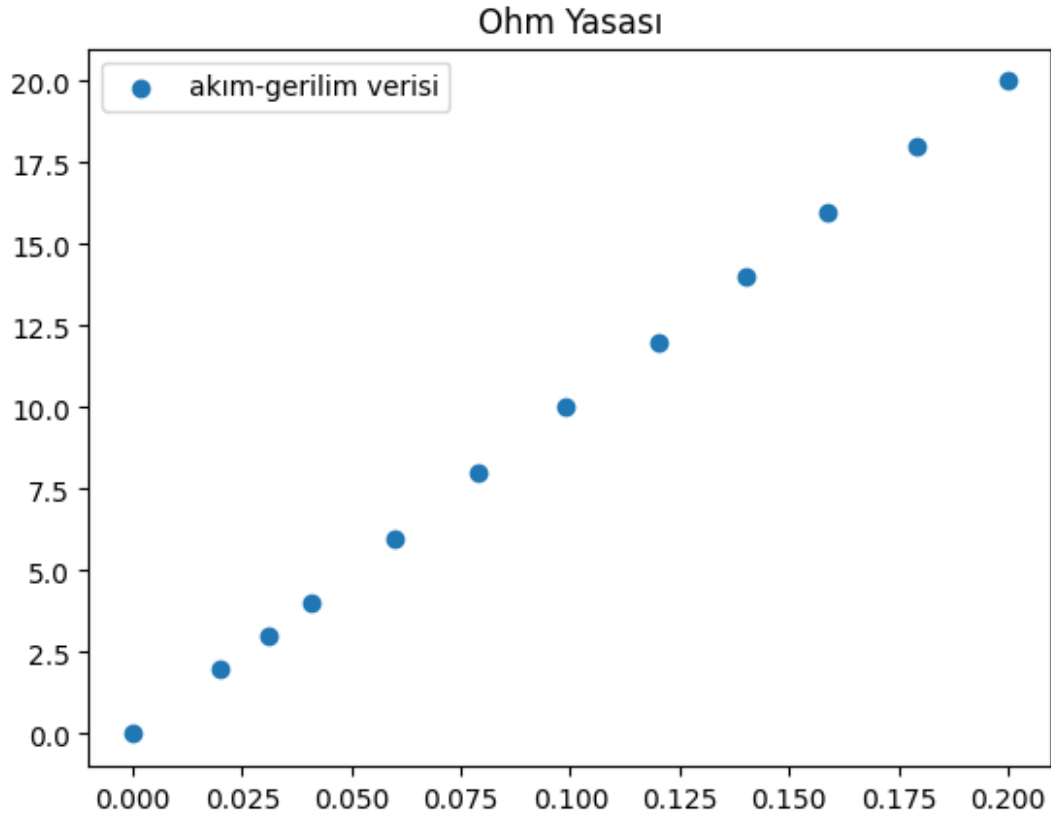


```python
plt.scatter(I, V)
plt.plot(I, V)
plt.show()
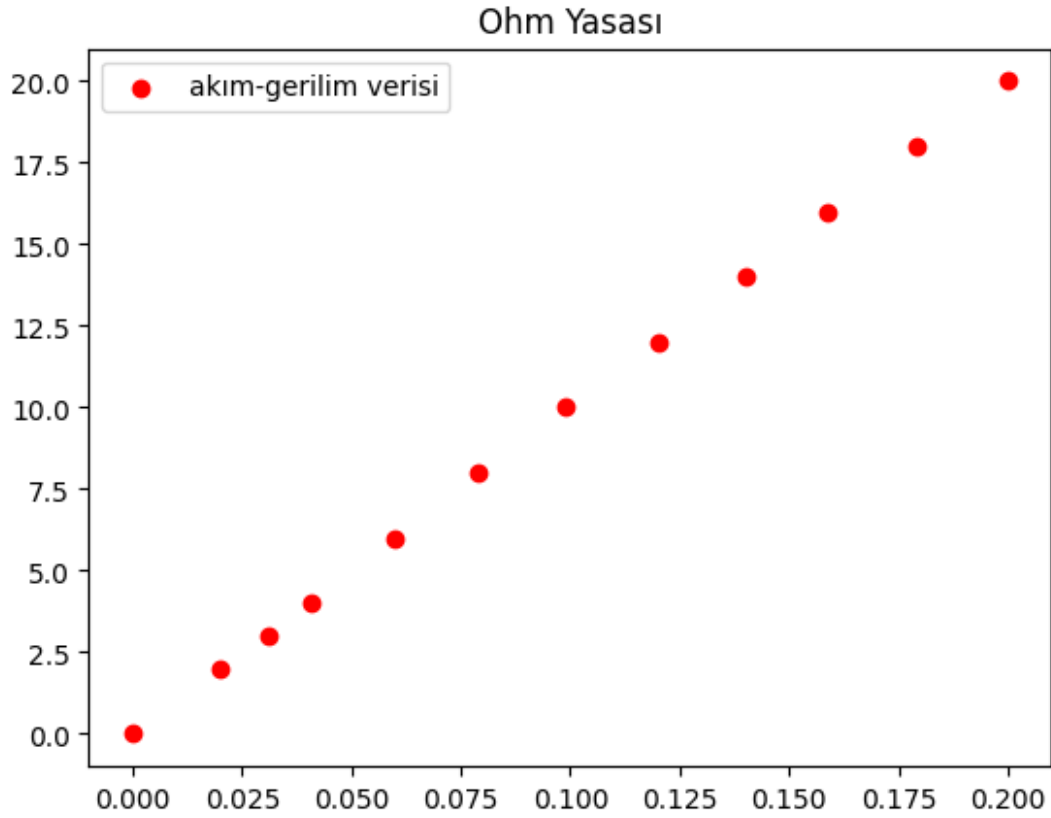```

```
# title (başlık) ekleme

plt.title("Ohm Yasası")

plt.scatter(I, V)
plt.show()
```

Ohm Yasası

```python
# label (etiket) ekleme

plt.title("Ohm Yasası")

plt.scatter(I, V, label = "akım-gerilim verisi")
plt.legend()
plt.show()
```

Ohm Yasası
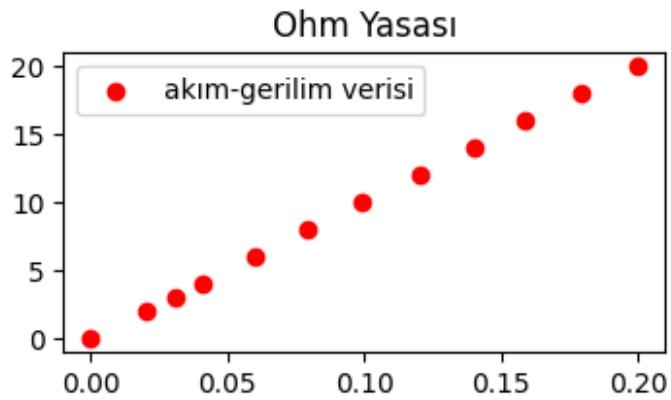
```
# renk değiştirme

plt.title("Ohm Yasası")

plt.scatter(I, V, color = "red", label = "akım-gerilim verisi")
plt.legend()
plt.show()
```
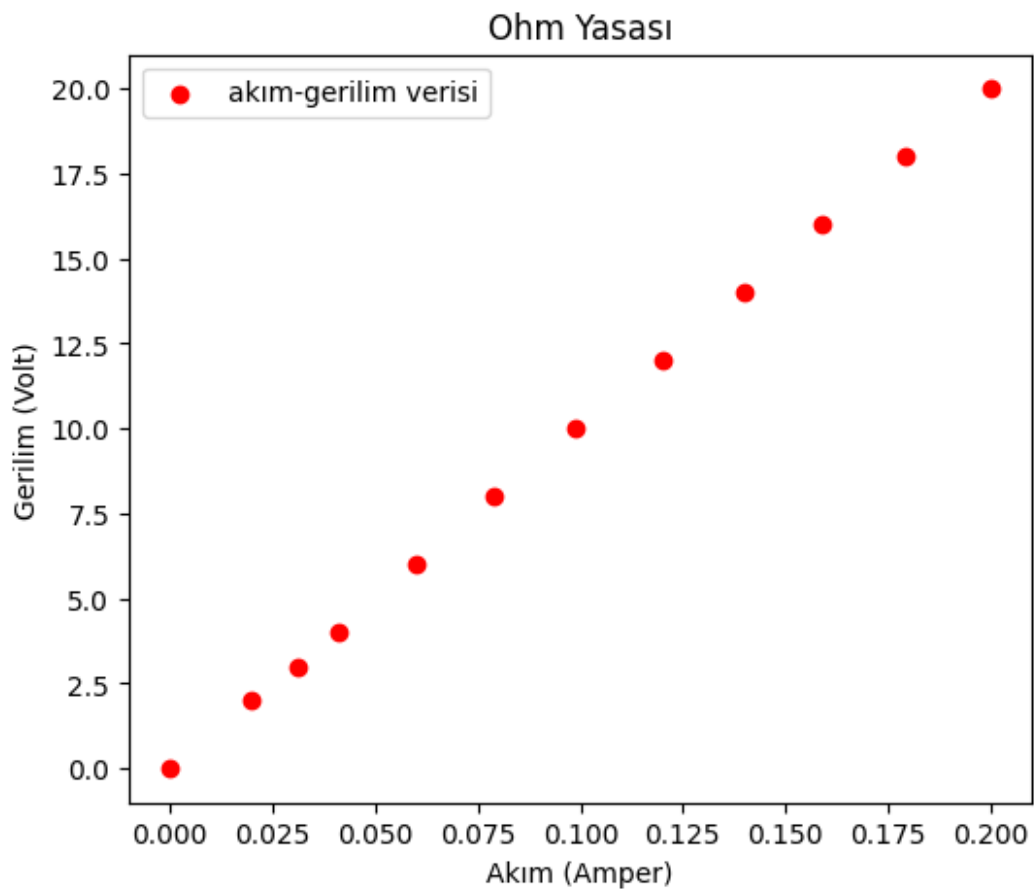
Ohm Yasası — akım-gerilim verisi

```python
# grafik boyutları

plt.figure(figsize = (4,2))

plt.title("Ohm Yasası")

plt.scatter(I, V, color = "red", label = "akım-gerilim verisi")
plt.legend()
plt.show()
```


Ohm Yasası — akım-gerilim verisi

```python
# eksenleri isimlendirme

plt.figure(figsize = (6,5))

plt.title("Ohm Yasası")

plt.scatter(I, V, color = "red", label = "akım-gerilim verisi")

plt.xlabel("Akım (Amper)")
plt.ylabel("Gerilim (Volt)")

plt.legend()
plt.show()
```
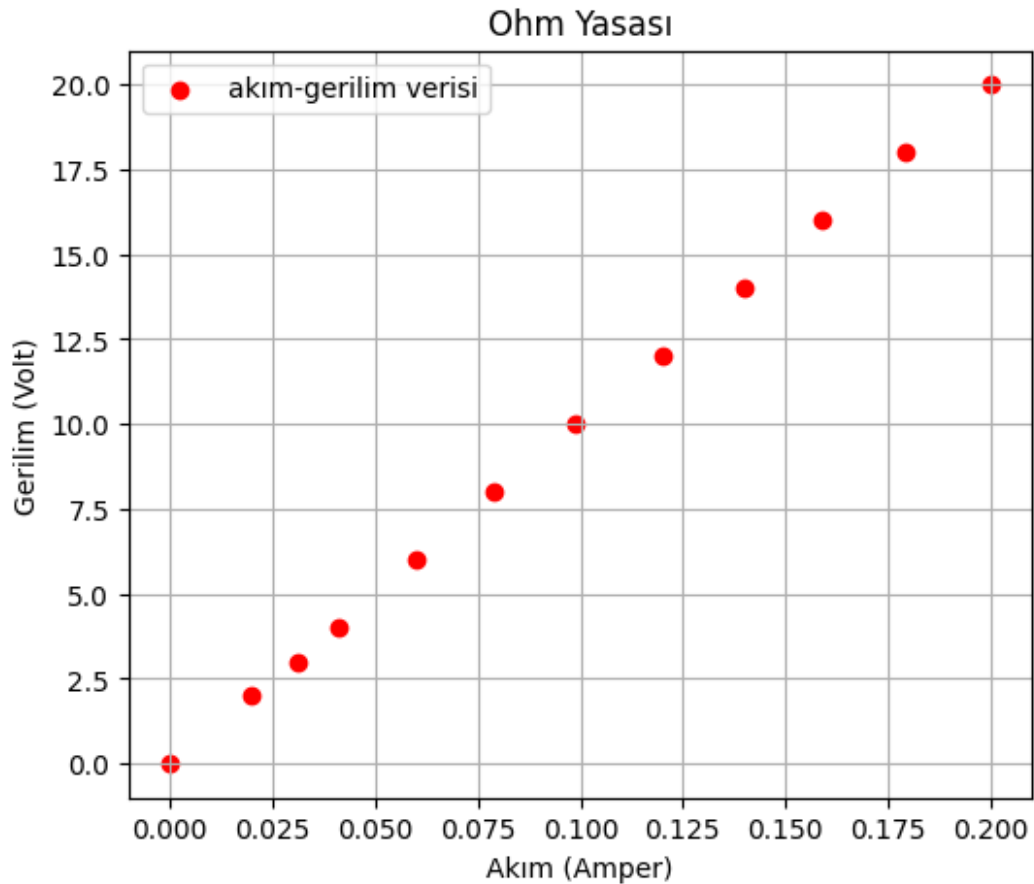


```python
# grid (ızgara) ekleme

plt.figure(figsize = (6,5))

plt.title("Ohm Yasası")

plt.scatter(I, V, color = "red", label = "akım-gerilim verisi")
```
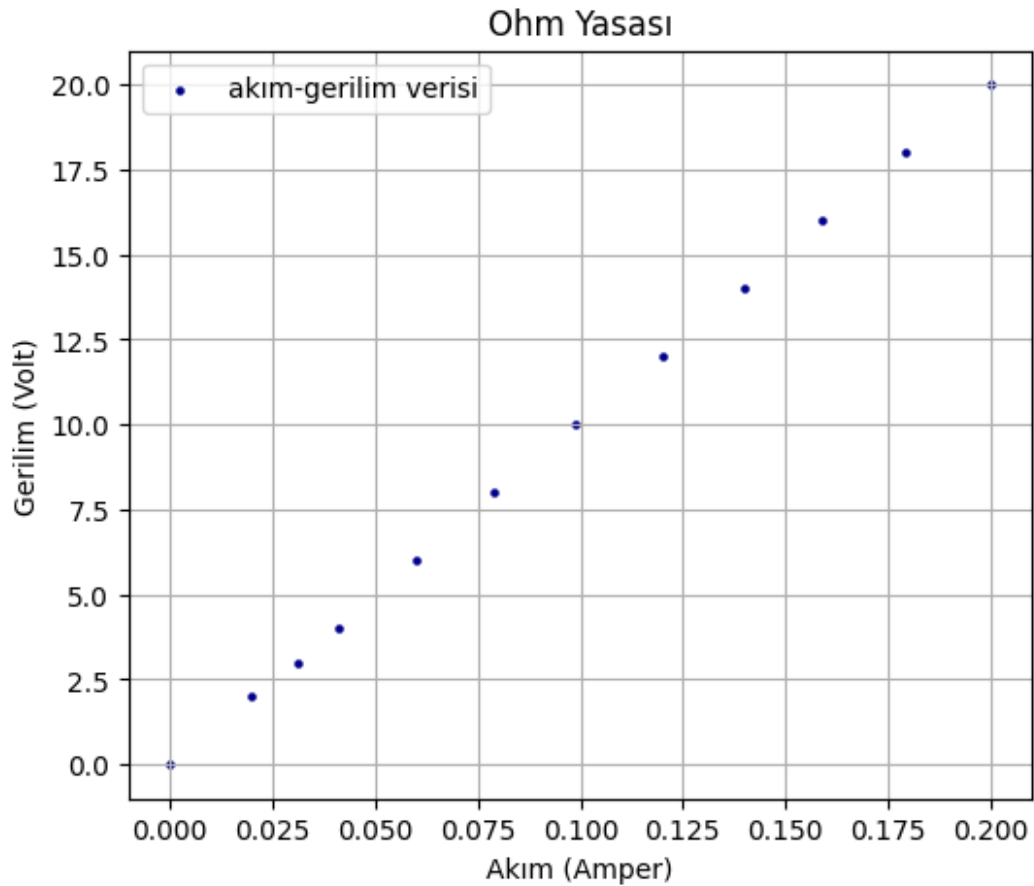
```
plt.xlabel("Akım (Amper)")
plt.ylabel("Gerilim (Volt)")

plt.grid()
plt.legend()
plt.show()
```



```
# veri noktaları boyutu

plt.figure(figsize = (6,5))

plt.title("Ohm Yasası")

plt.scatter(I, V, color = "darkblue", s = 5, label = "akım-gerilim
verisi")

plt.xlabel("Akım (Amper)")
plt.ylabel("Gerilim (Volt)")

plt.grid()
plt.legend()
plt.show()
```

Ohm Yasası

```
plt.figure(figsize = (6,5))

plt.title("Ohm Yasası")

plt.scatter(I, V, color = "darkblue", marker = "<", s = 20, label =
"akım-gerilim verisi")

plt.xlabel("Akım (Amper)")
plt.ylabel("Gerilim (Volt)")

plt.grid()
plt.legend()
plt.show()
```

Ohm Yasası

```python
plt.figure(figsize = (6,5))

plt.title("Ohm Yasası")

plt.scatter(I, V, color = "red", marker = "+", s = 50, label = "akım-
gerilim verisi")

plt.xlabel("Akım (Amper)")
plt.ylabel("Gerilim (Volt)")

plt.grid()
plt.legend()
plt.show()
```
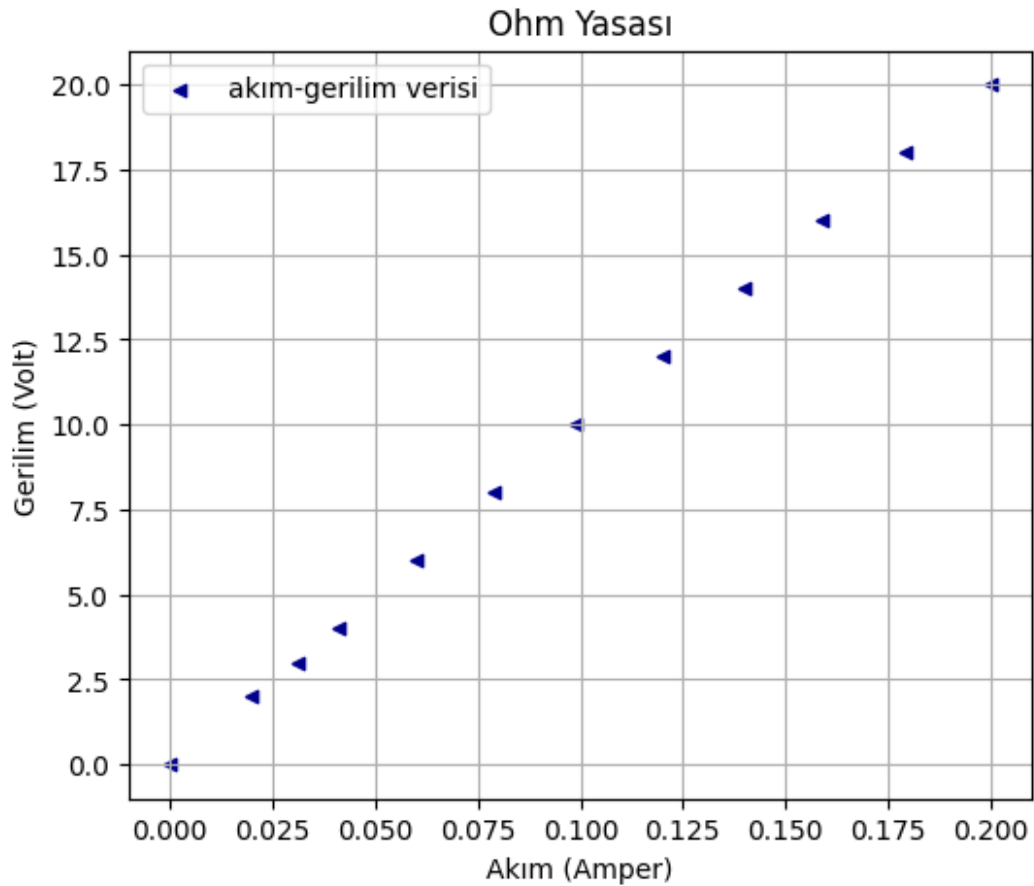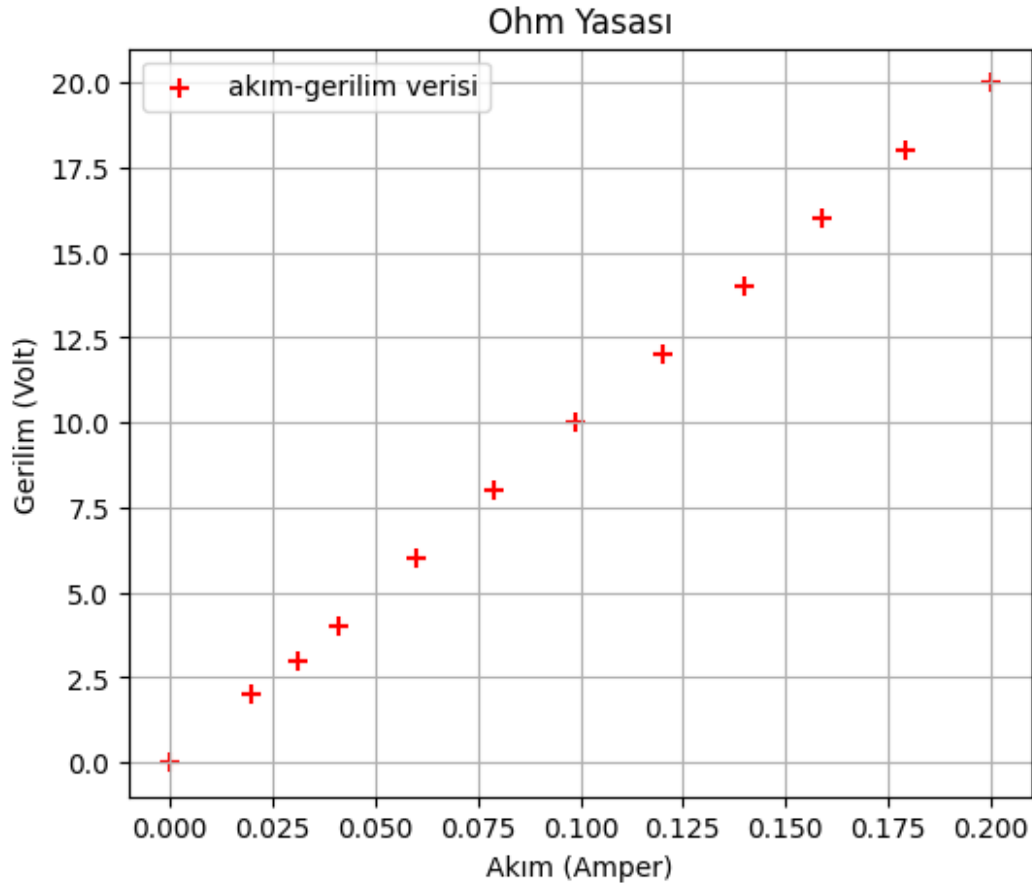
Ohm Yasası

Hata çubukları

```python
DeltaV = [0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5, 0.5]

DeltaI = [0.005, 0.005, 0.005, 0.005, 0.005, 0.005, 0.005, 0.005,
0.005, 0.005, 0.005, 0.005]

import pandas as pd

df = pd.DataFrame()
df["I"] = I
df["V"] = V
df["DI"] = DeltaI
df["DV"] = DeltaV

df
```

	I	V	DI	DV
0	0.000	0	0.005	0.5
1	0.020	2	0.005	0.5
2	0.031	3	0.005	0.5
3	0.041	4	0.005	0.5

```
4    0.060    6   0.005   0.5
5    0.079    8   0.005   0.5
6    0.099   10   0.005   0.5
7    0.120   12   0.005   0.5
8    0.140   14   0.005   0.5
9    0.159   16   0.005   0.5
10   0.179   18   0.005   0.5
11   0.200   20   0.005   0.5

plt.figure(figsize = (8,6))

plt.title("Ohm Yasası")

plt.errorbar(df.I, df.V, xerr = df.DI,  yerr = df.DV, label = "veri",
            fmt = "o", color = "black", ecolor = "red", elinewidth =
1, capsize = 4)

plt.xlabel("Akım (Amper)")
plt.ylabel("Gerilim (Volt)")

plt.legend()
plt.show()
```

```python
plt.figure(figsize = (8,6))

plt.title("Ohm Yasası")

plt.errorbar(df.I, df.V, xerr = df.DI,  yerr = df.DV, label = "veri",
             fmt = "o", color = "black", ecolor = "red", elinewidth =
1, capsize = 4)
plt.plot(df.I, df.V)

plt.xlabel("Akım (Amper)")
plt.ylabel("Gerilim (Volt)")

plt.legend()
plt.show()
```
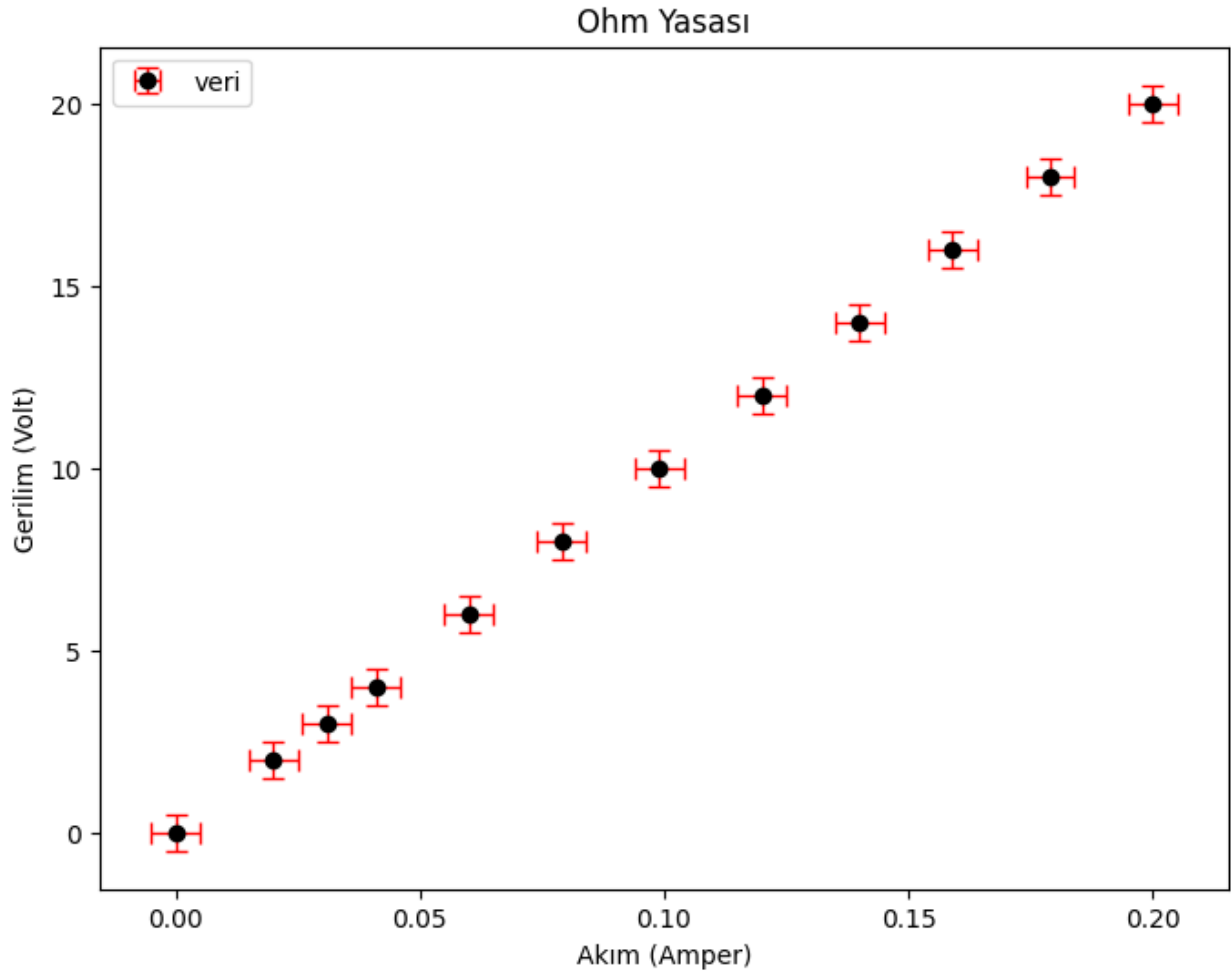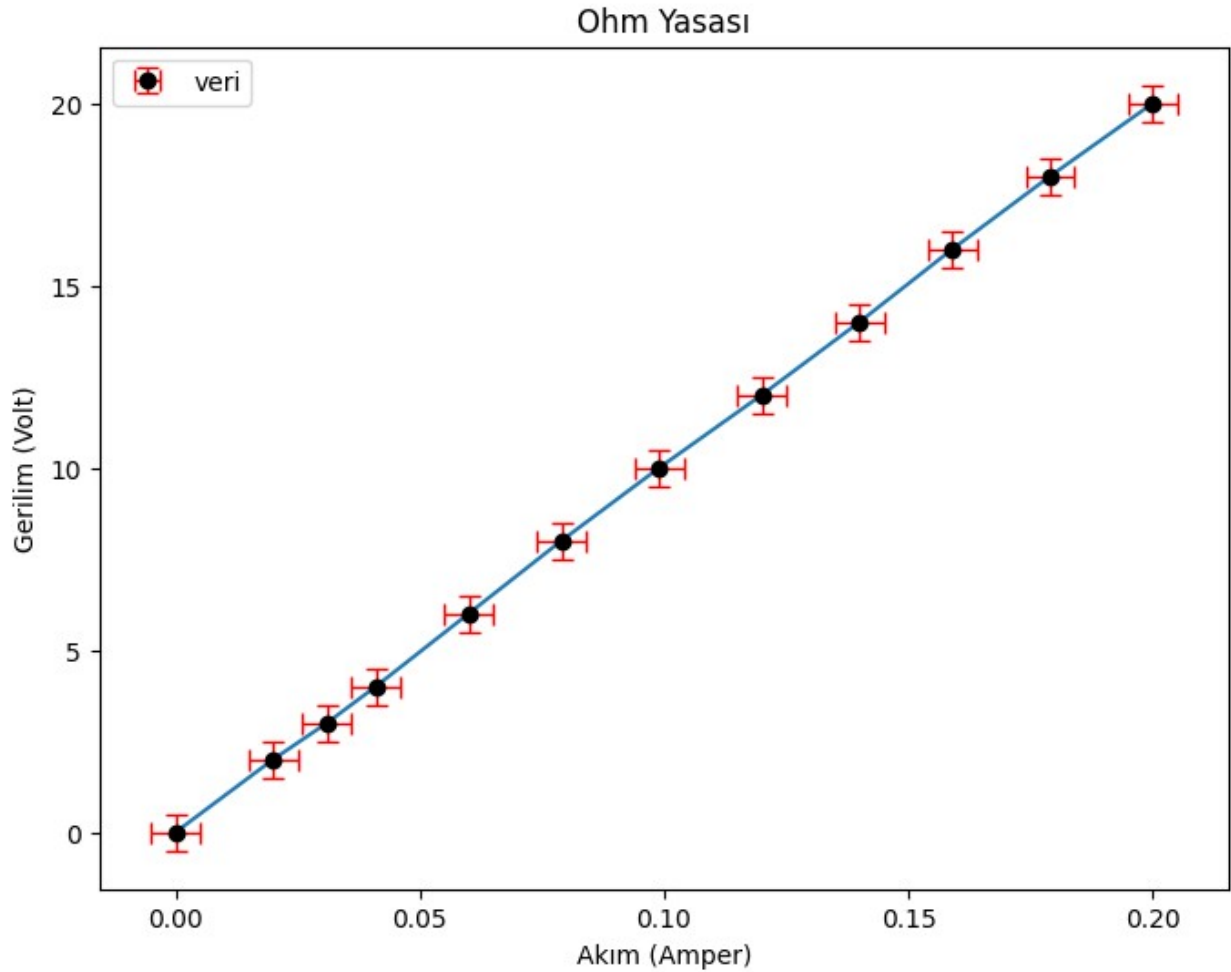
subplot

```python
# data1
x1 = np.array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10])
y1 = np.array([3, 8, 1, 10, 12, 8, 9, 11, 23, 25, 32])

# data 2
x2 = np.array([0, 1, 2, 3])
y2 = np.array([10, 20, 30, 40])

# plot 1:
plt.subplot(2, 1, 1)
plt.scatter(x1, y1)
plt.plot(x1, y1)
#plt.grid()

#plot 2:
plt.subplot(2, 1, 2)
plt.scatter(x2, y2)
plt.plot(x2, y2)
```
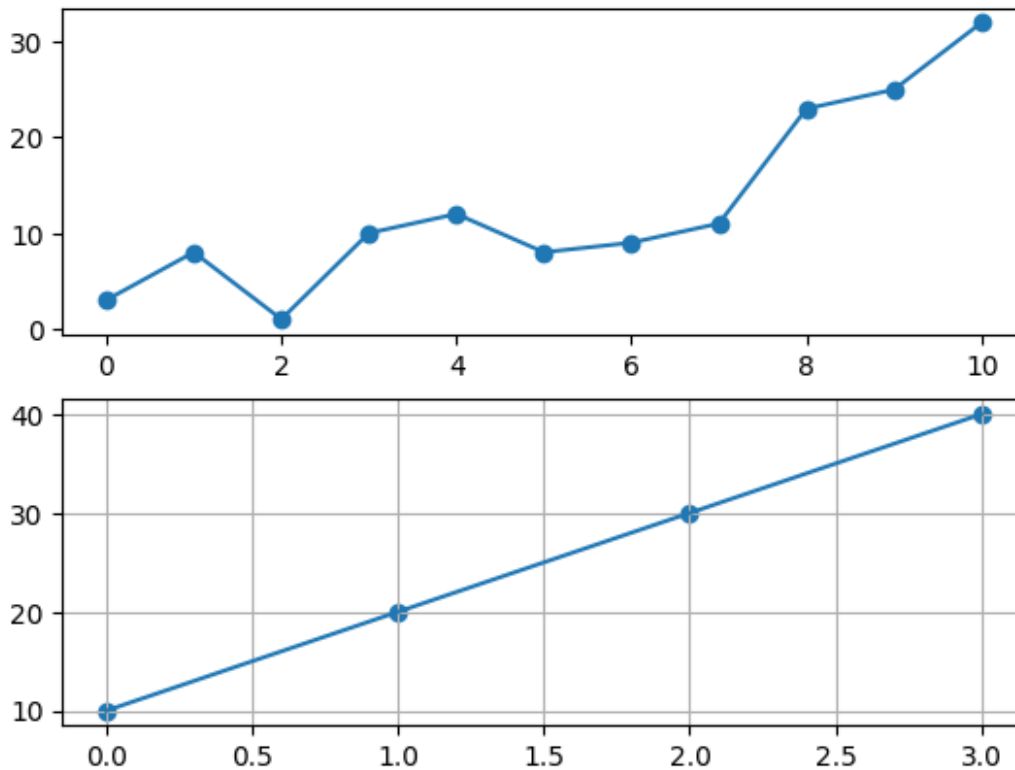
```
plt.grid()

plt.show()
```



```
# data1
x1 = np.array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10])
y1 = np.array([3, 8, 1, 10, 12, 8, 9, 11, 23, 25, 32])

# data 2
x2 = np.array([0, 1, 2, 3])
y2 = np.array([10, 20, 30, 40])

# plot 1:
plt.subplot(2, 1, 1)
plt.scatter(x1, y1, color = "red", marker = "<", s = 20, label =
"akım-gerilim verisi")
plt.plot(x1, y1)
#plt.grid()
plt.legend()

#plot 2:
plt.subplot(2, 1, 2)
plt.scatter(x2, y2, color = "darkblue", marker = "<", s = 20, label =
"akım-gerilim verisi")
plt.plot(x2,y2)
```
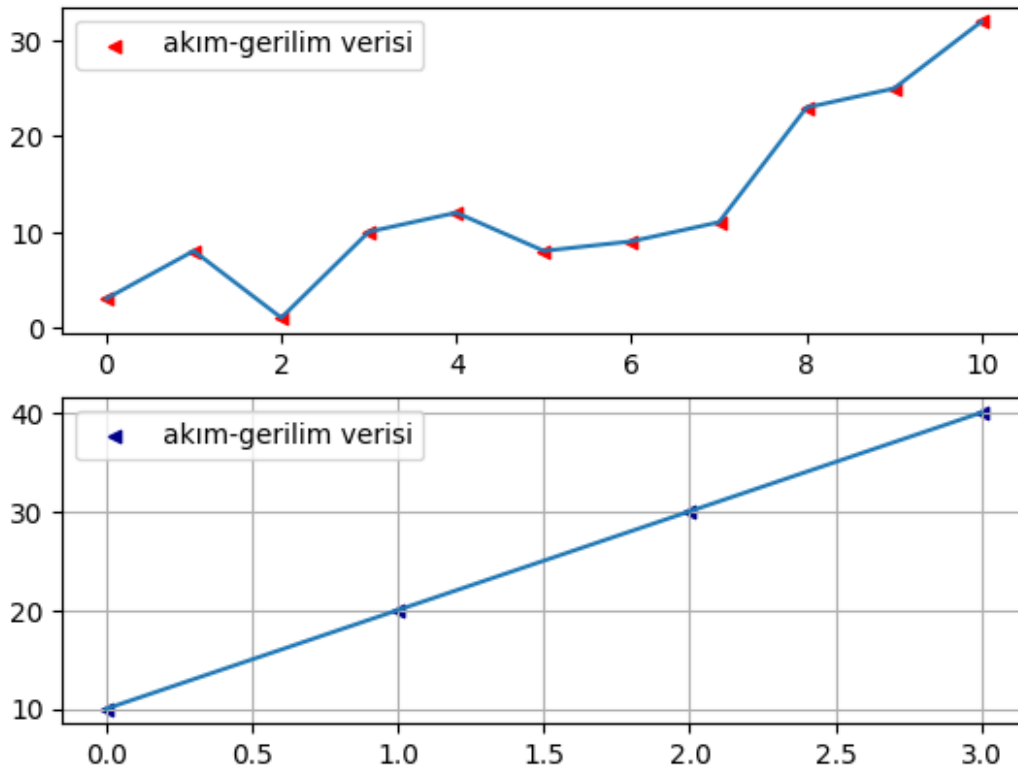
```
plt.grid()
plt.legend()

plt.show()
```



```
df
```

	I	V	DI	DV
0	0.000	0	0.005	0.5
1	0.020	2	0.005	0.5
2	0.031	3	0.005	0.5
3	0.041	4	0.005	0.5
4	0.060	6	0.005	0.5
5	0.079	8	0.005	0.5
6	0.099	10	0.005	0.5
7	0.120	12	0.005	0.5
8	0.140	14	0.005	0.5
9	0.159	16	0.005	0.5
10	0.179	18	0.005	0.5
11	0.200	20	0.005	0.5

```
# plot 1:
plt.subplot(2, 1, 1)
plt.scatter(df.I, df.V, color = "red", marker = "<", s = 20, label =
"akım-gerilim verisi")
```

```python
plt.plot(df.I, df.V)
plt.grid()
plt.legend()

# plot 2:
plt.subplot(2, 1, 2)
plt.scatter(df.I, df.V, color = "black", marker = "o", s = 20, label =
"akım-gerilim verisi")
plt.plot(df.I, df.V)
plt.grid()
plt.legend()

plt.show()
```
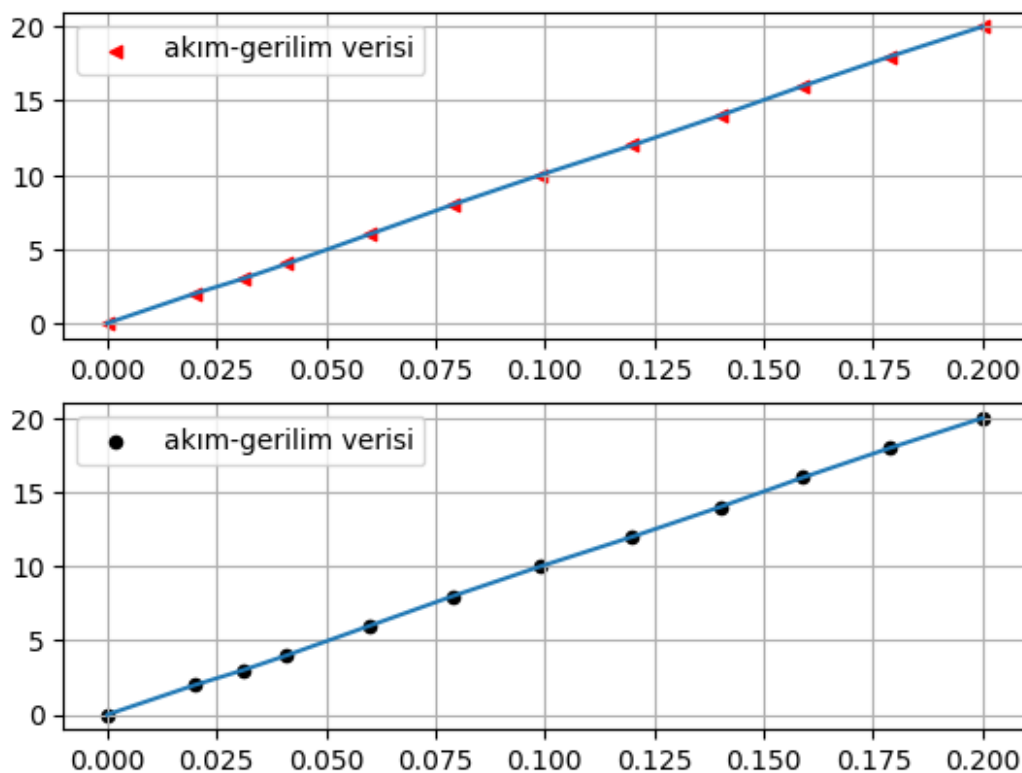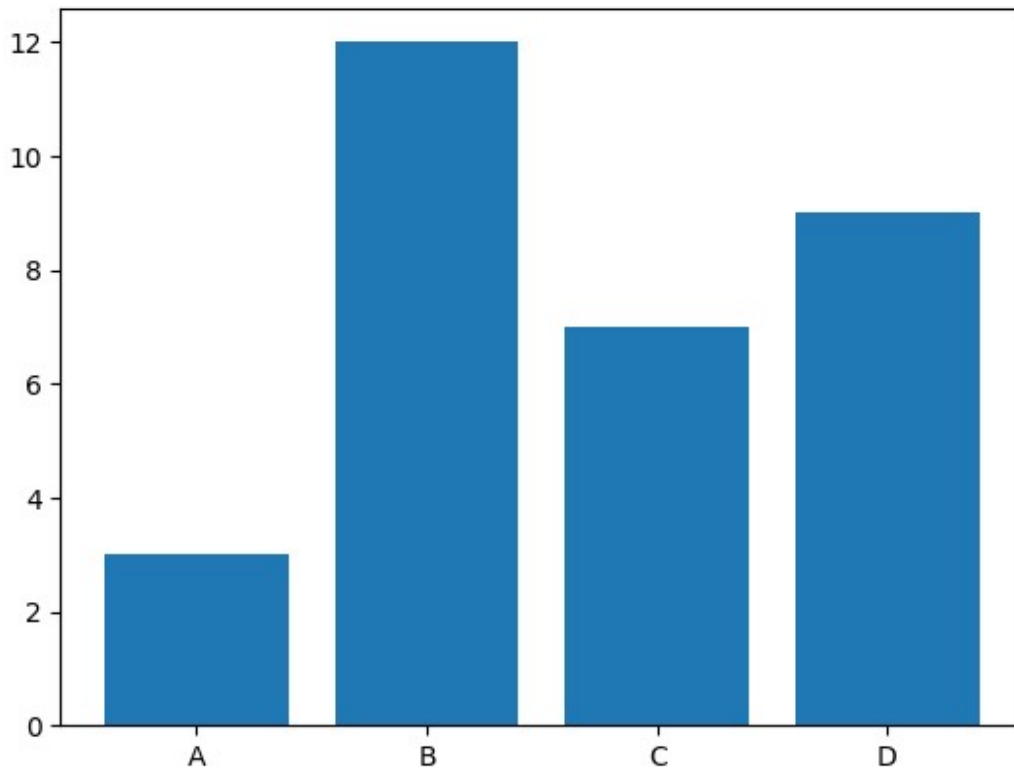

bar plot

```python
x = np.array(["A", "B", "C", "D"])
y = np.array([3, 12, 7, 9])

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

pie chart

```
plt.pie(df.I)
plt.show()
```

```
plt.pie(df.V)
plt.show()
```

Fonksiyon grafikleri

```python
x1 = np.linspace(0.0, 5.0)
x2 = np.linspace(0.0, 2.0)

y1 = np.cos(2 * np.pi * x1) * np.exp(-x1/4)
y2 = np.cos(2 * np.pi * x2)

plt.title("Sönümlü ve sönümsüz salınıcı")

# plot 1:
plt.subplot(2, 1, 1)
plt.scatter(x1, y1, color = "darkblue", marker = "o", s = 20, label =
"Sönümlü salınım")
plt.plot(x1, y1, color = "red")
plt.grid()
plt.legend()

# plot 2:
plt.subplot(2, 1, 2)
plt.scatter(x2, y2, color = "black", marker = "o", s = 20, label =
"Sönümsüz salınım")
plt.plot(x2, y2, color = "red")
plt.grid()
plt.legend()

plt.show()
```
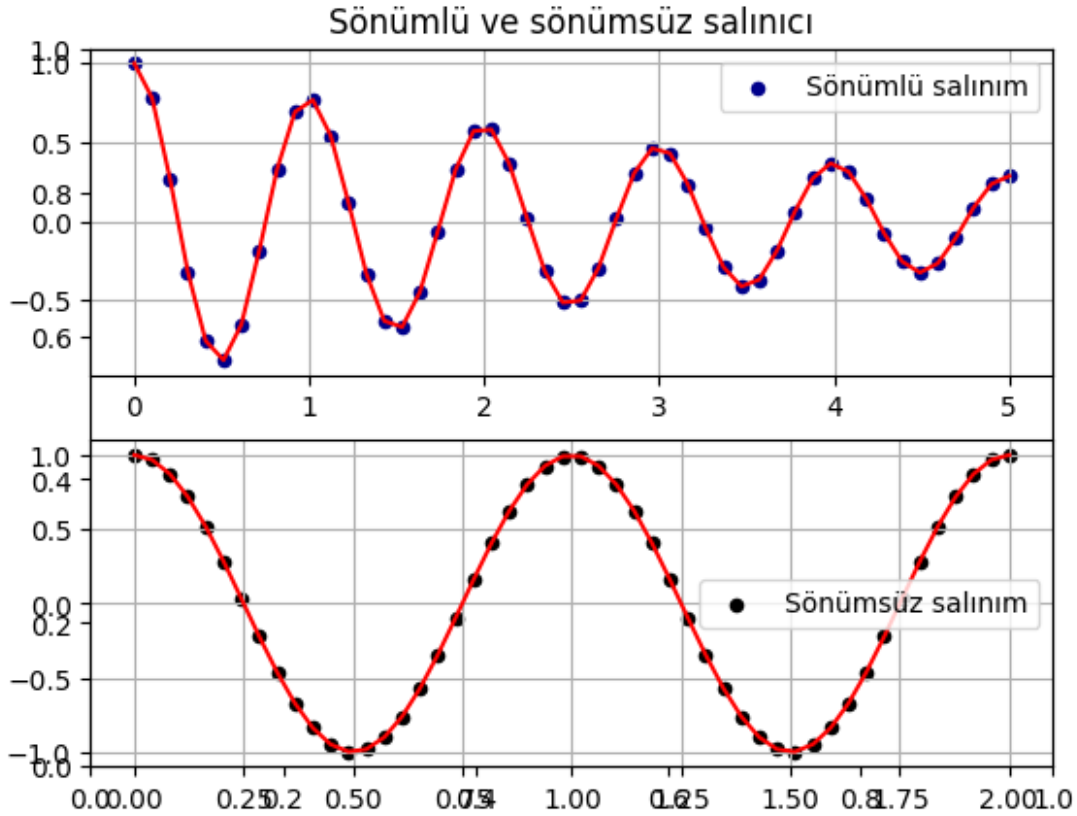
Sönümlü ve sönümsüz salınıcı

```python
def sin(x):
    return np.sin(np.deg2rad(x))

x = np.arange(0, 365, 5)

plt.figure(figsize = (6,3))

plt.title("Sin(x) fonksiyonunun grafiği")

plt.scatter(x, sin(x), color = "darkblue", s = 5, label = "Sin(x)")
plt.plot(x, sin(x), color = "red", label = "Sin(x)")

plt.xlabel("Açı")
plt.ylabel("Sin(x)")

plt.grid()
plt.legend()
plt.show()
```

Sin(x) fonksiyonunun grafiği