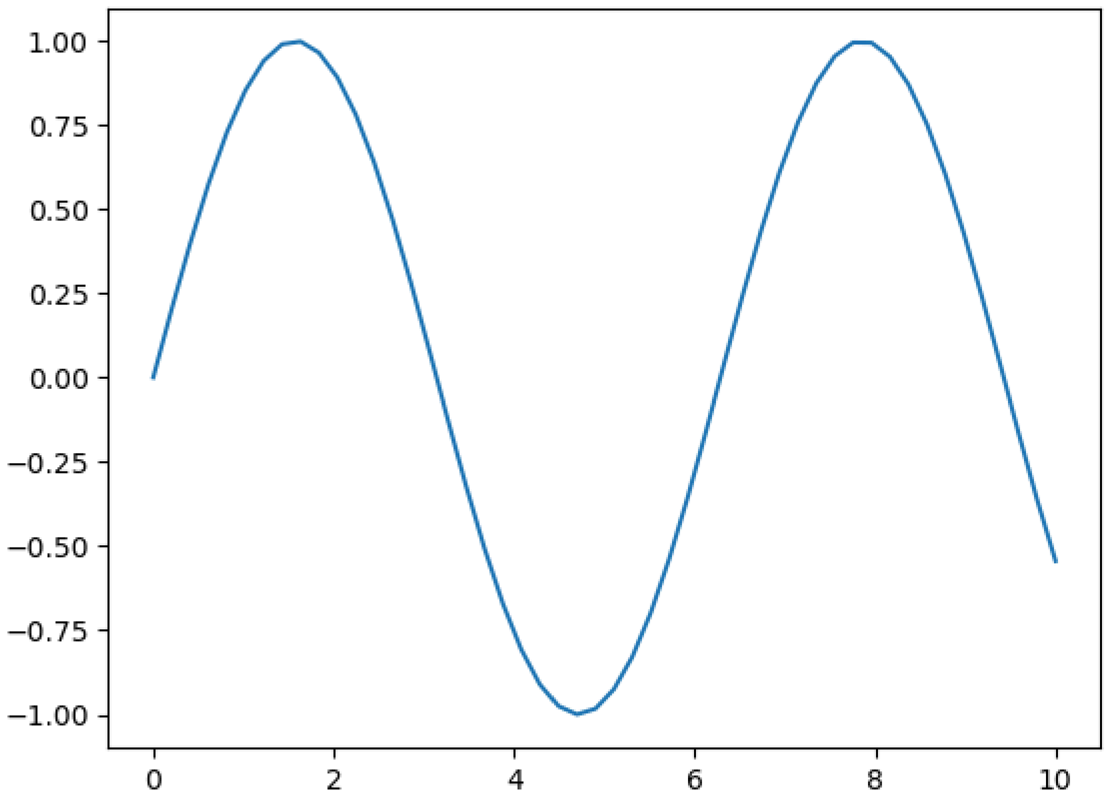
In [1]:
```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

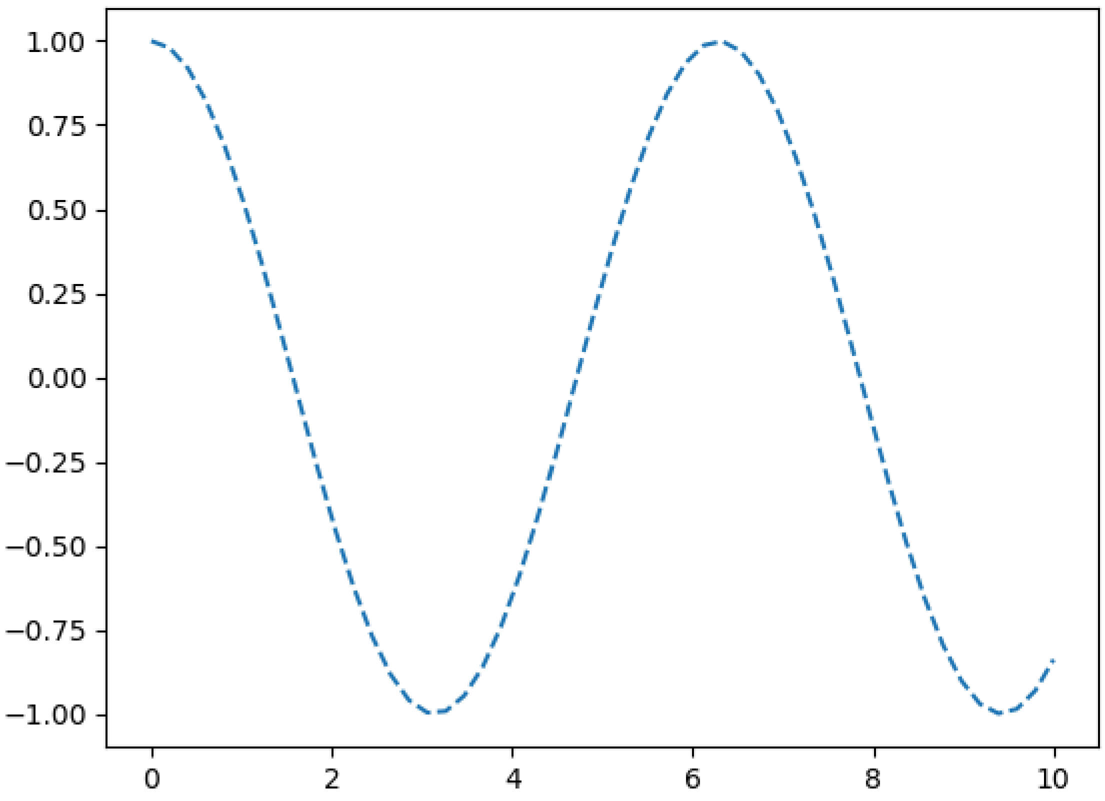
In [34]:
```python
x1=np.linspace(0,10,50)
x1
```

Out[34]:
```
array([ 0.        ,  0.20408163,  0.40816327,  0.6122449 ,  0.81632653,
        1.02040816,  1.2244898 ,  1.42857143,  1.63265306,  1.83673469,
        2.04081633,  2.24489796,  2.44897959,  2.65306122,  2.85714286,
        3.06122449,  3.26530612,  3.46938776,  3.67346939,  3.87755102,
        4.08163265,  4.28571429,  4.48979592,  4.69387755,  4.89795918,
        5.10204082,  5.30612245,  5.51020408,  5.71428571,  5.91836735,
        6.12244898,  6.32653061,  6.53061224,  6.73469388,  6.93877551,
        7.14285714,  7.34693878,  7.55102041,  7.75510204,  7.95918367,
        8.16326531,  8.36734694,  8.57142857,  8.7755102 ,  8.97959184,
        9.18367347,  9.3877551 ,  9.59183673,  9.79591837, 10.        ])
```

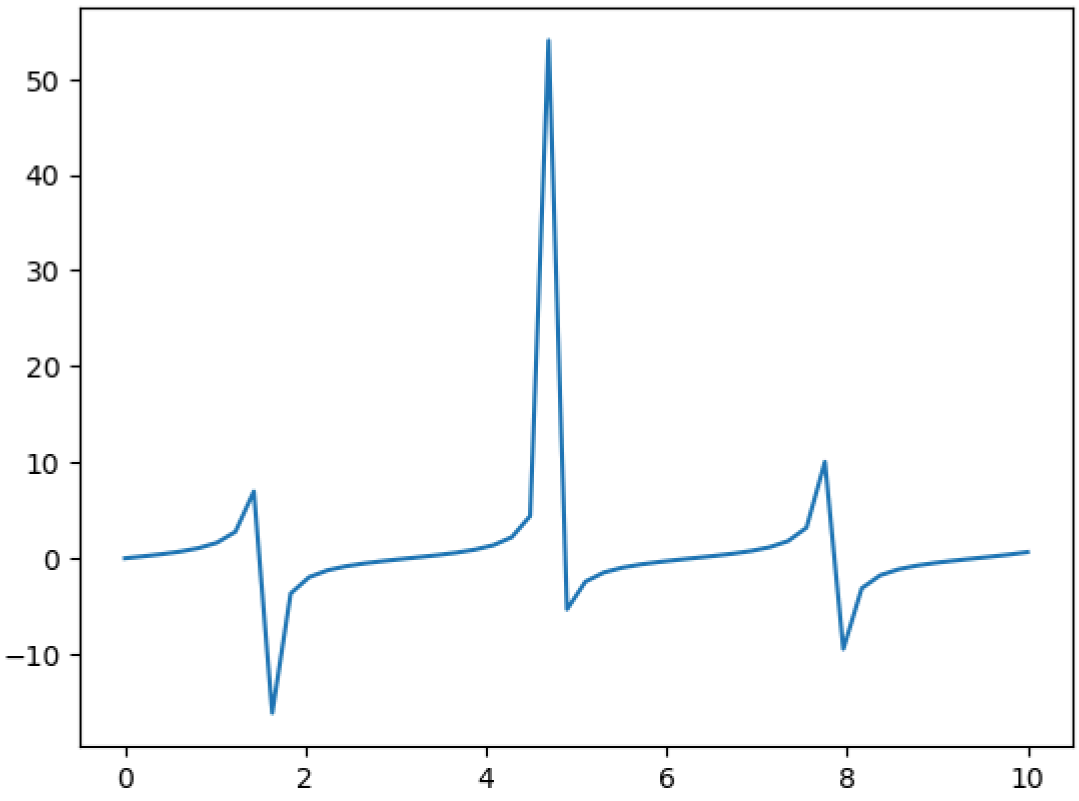
In [35]:
```python
plt.plot(x1,np.sin(x1),'-')
plt.show()
```



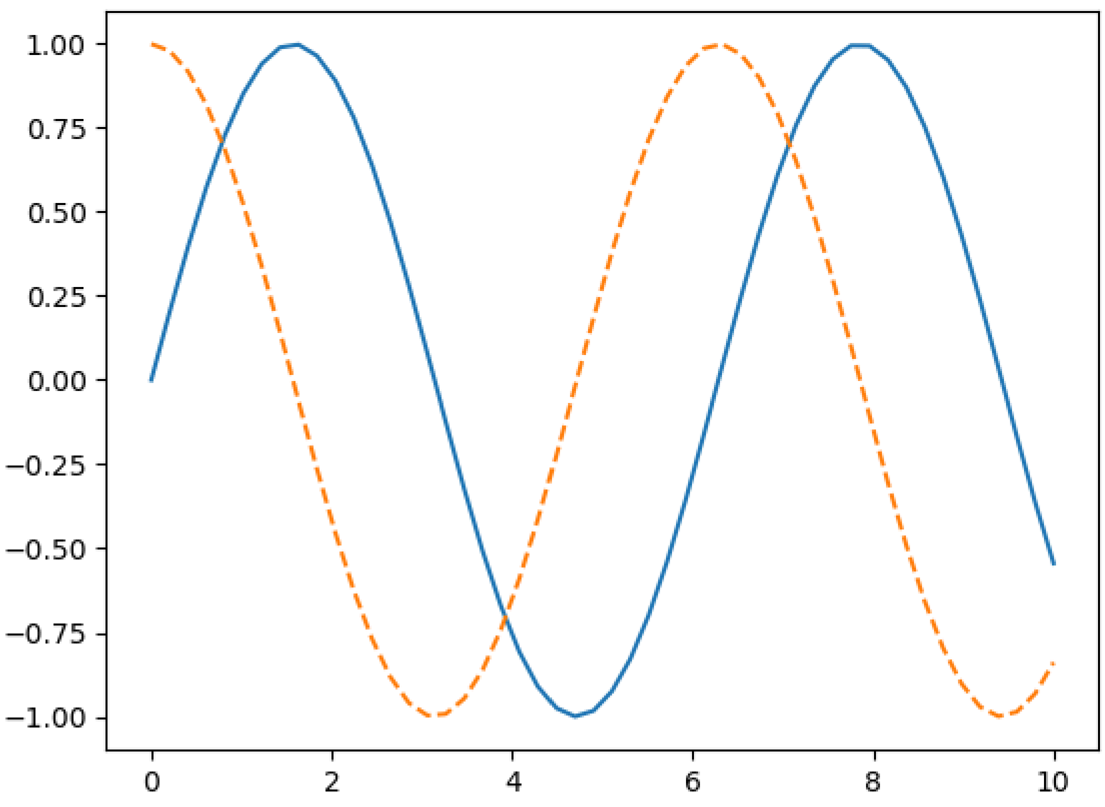
In [36]:
```python
plt.plot(x1,np.cos(x1),'--')
plt.show()
```



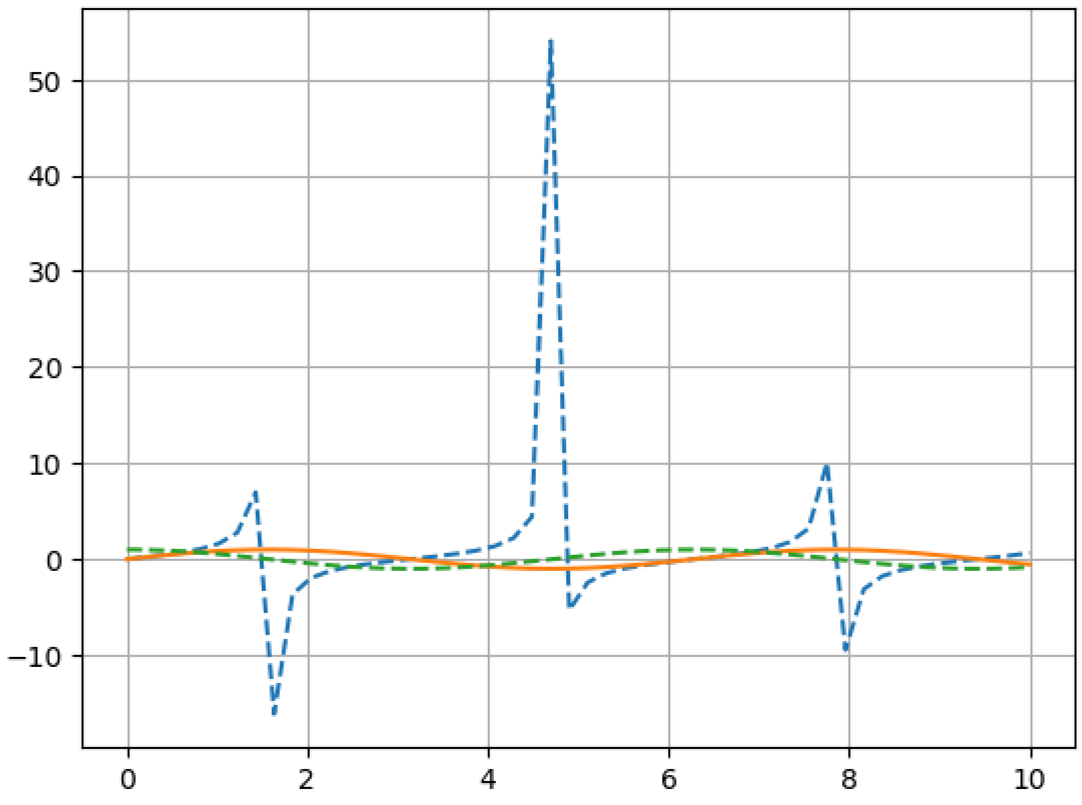
In [37]:
```
plt.plot(x1,np.tan(x1),'-')
plt.show()
```



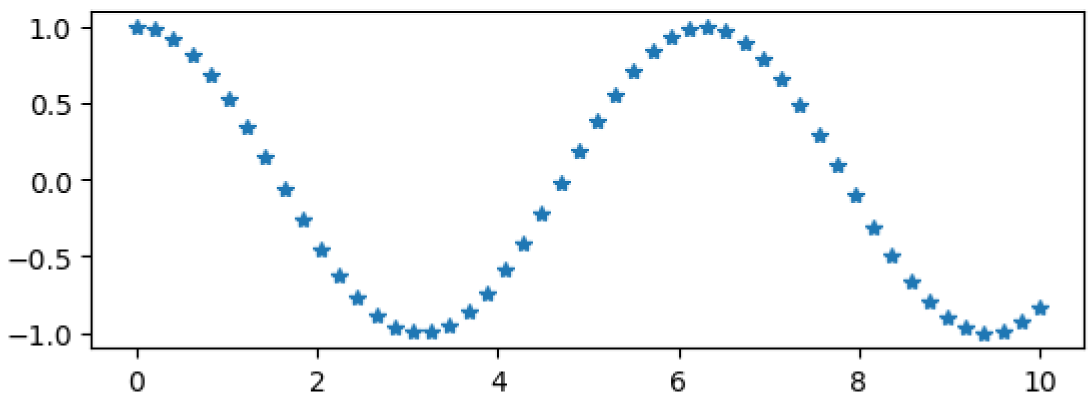
In [3]:
```
%matplotlib inline
x1=np.linspace(0,10,50)
plt.plot(x1,np.sin(x1),'-')
plt.plot(x1,np.cos(x1),'--')
plt.show()
```



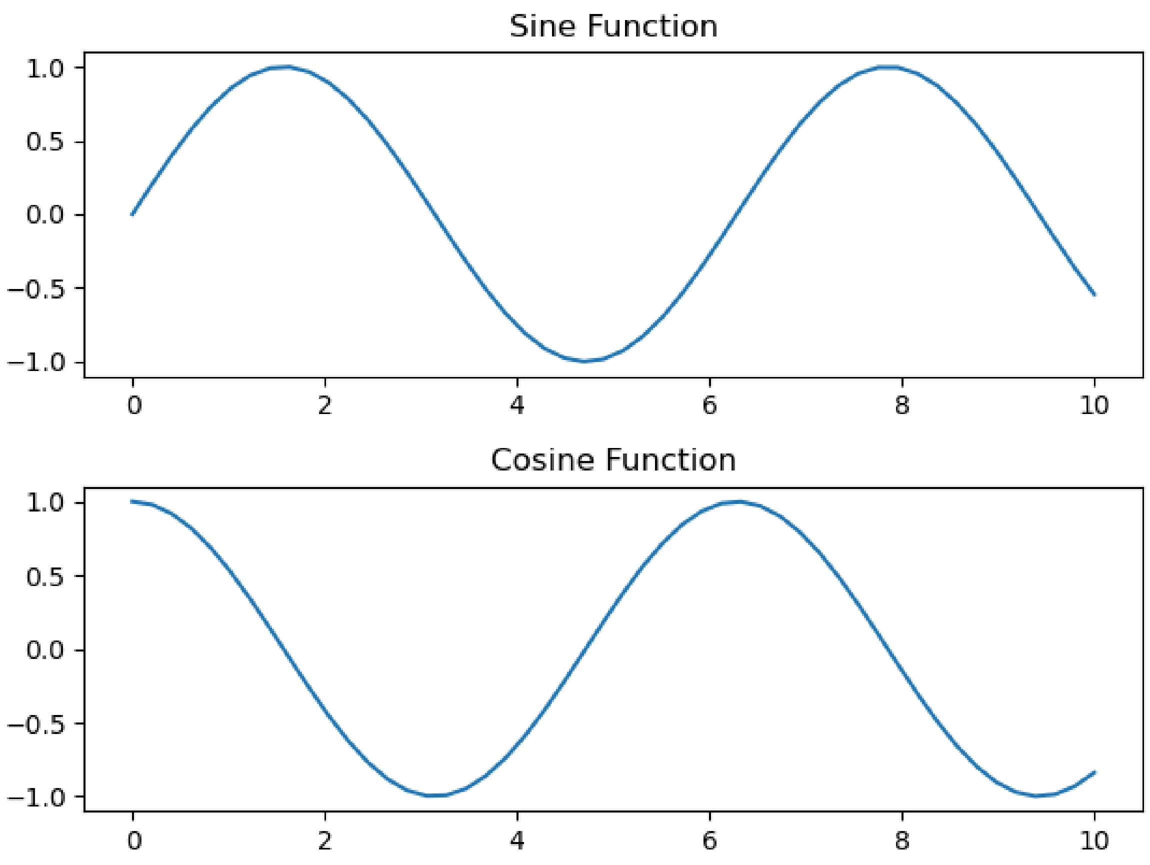
In [6]:
```
plt.plot(x1,np.tan(x1),'--')
plt.plot(x1,np.sin(x1),'-')
plt.plot(x1,np.cos(x1),'--')
plt.grid(True)
plt.show()
```



In [7]:
```
plt.subplot(2,1,1)
plt.plot(x1,np.cos(x1),'*')
plt.show()
```



```
In [9]: plt.subplot(2,1,1)
        plt.plot(x1,np.sin(x1))
        plt.title("Sine Function")

        plt.subplot(2,1,2)
        plt.plot(x1,np.cos(x1))
        plt.title("Cosine Function")

        plt.tight_layout()
        plt.show()
```



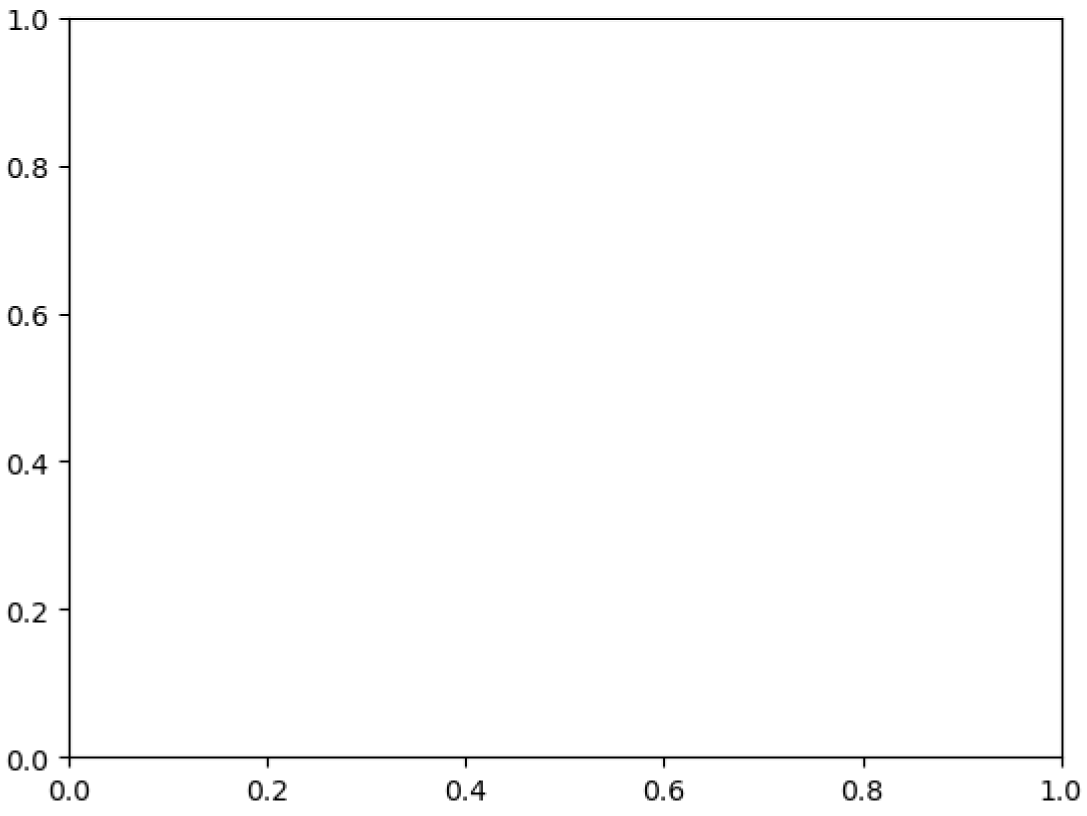
```
In [10]: print(plt.gcf()) #get current figure info
```

```
Figure(640x480)
```

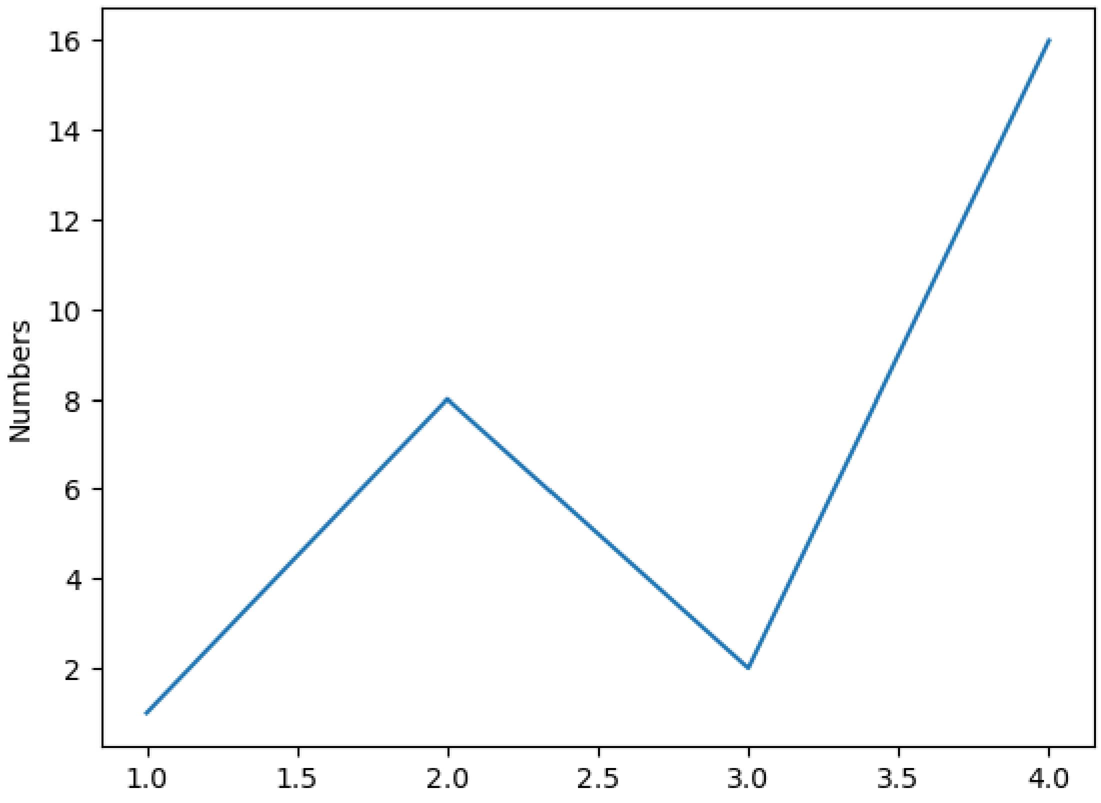
```
In [11]: print(plt.gca()) #fet current axis info
```

```
Axes(0.125,0.11;0.775x0.77)
```

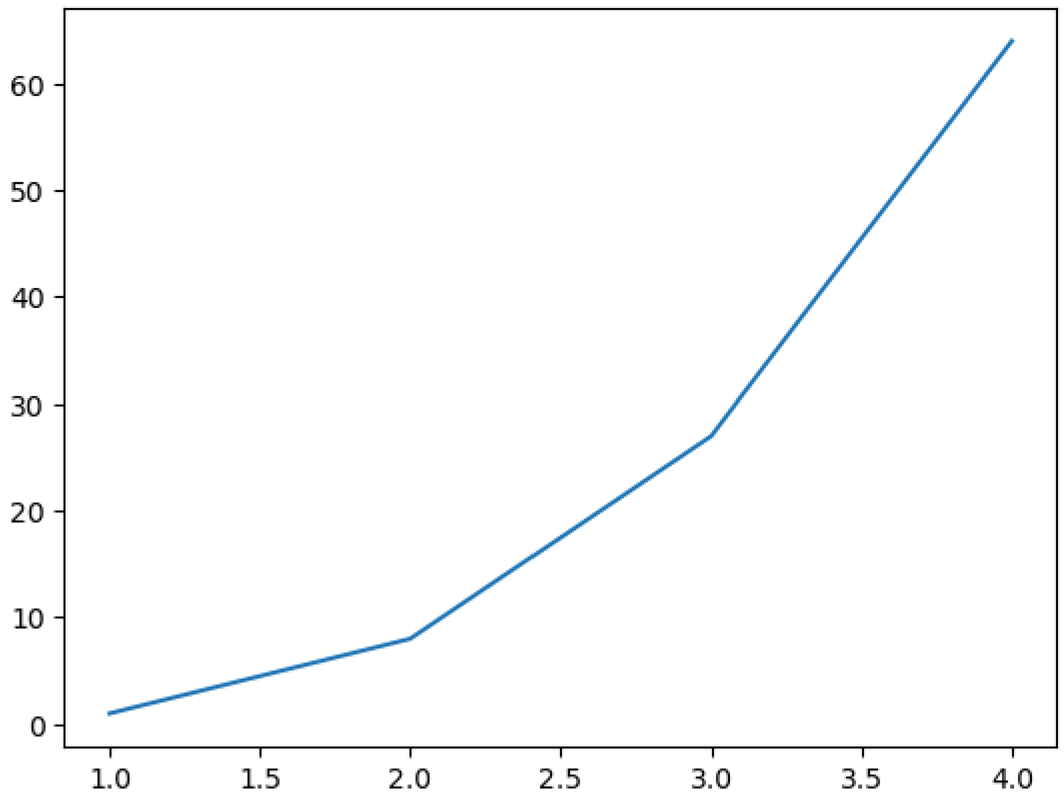
```
In [12]: plt.show()
```



In [13]:
```
plt.plot([1,2,3,4],[1,8,2,16])
plt.ylabel("Numbers")
plt.show()
```



In [14]:
```
plt.plot([1,2,3,4],[1,8,27,64])
plt.show()
```

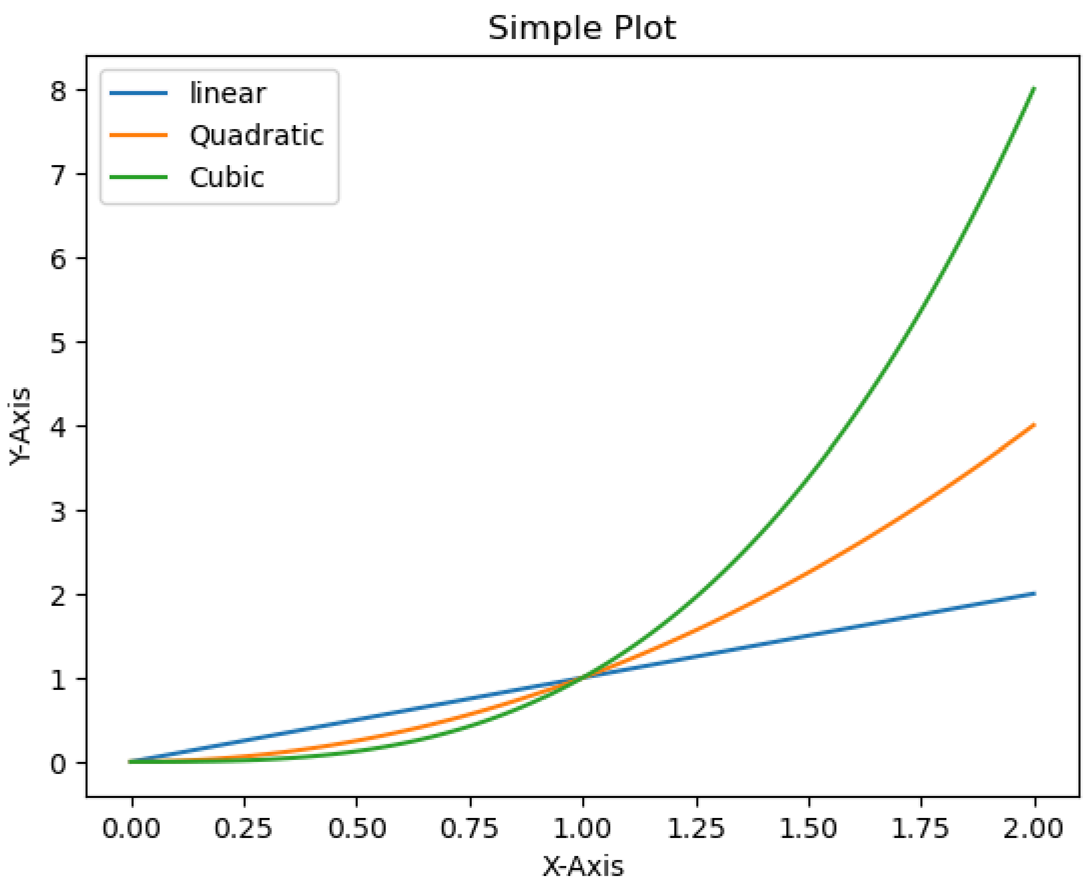


In [39]:
```
x=np.linspace(0,2,100)
x
```

Out[39]:
```
array([0.        , 0.02020202, 0.04040404, 0.06060606, 0.08080808,
       0.1010101 , 0.12121212, 0.14141414, 0.16161616, 0.18181818,
       0.2020202 , 0.22222222, 0.24242424, 0.26262626, 0.28282828,
       0.3030303 , 0.32323232, 0.34343434, 0.36363636, 0.38383838,
       0.4040404 , 0.42424242, 0.44444444, 0.46464646, 0.48484848,
       0.50505051, 0.52525253, 0.54545455, 0.56565657, 0.58585859,
       0.60606061, 0.62626263, 0.64646465, 0.66666667, 0.68686869,
       0.70707071, 0.72727273, 0.74747475, 0.76767677, 0.78787879,
       0.80808081, 0.82828283, 0.84848485, 0.86868687, 0.88888889,
       0.90909091, 0.92929293, 0.94949495, 0.96969697, 0.98989899,
       1.01010101, 1.03030303, 1.05050505, 1.07070707, 1.09090909,
       1.11111111, 1.13131313, 1.15151515, 1.17171717, 1.19191919,
       1.21212121, 1.23232323, 1.25252525, 1.27272727, 1.29292929,
       1.31313131, 1.33333333, 1.35353535, 1.37373737, 1.39393939,
       1.41414141, 1.43434343, 1.45454545, 1.47474747, 1.49494949,
       1.51515152, 1.53535354, 1.55555556, 1.57575758, 1.5959596 ,
       1.61616162, 1.63636364, 1.65656566, 1.67676768, 1.6969697 ,
       1.71717172, 1.73737374, 1.75757576, 1.77777778, 1.7979798 ,
       1.81818182, 1.83838384, 1.85858586, 1.87878788, 1.8989899 ,
       1.91919192, 1.93939394, 1.95959596, 1.97979798, 2.        ])
```

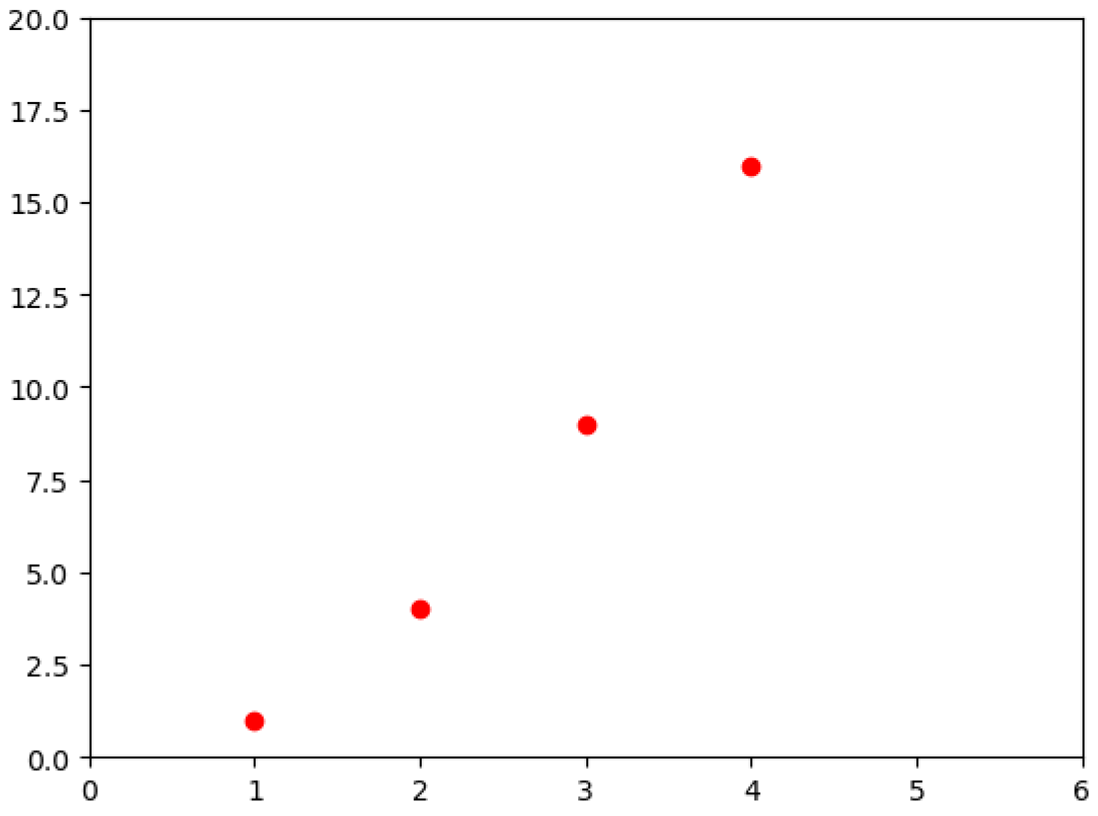
State-Machine Interface

In [16]:
```
x=np.linspace(0,2,100)
plt.plot(x,x,label='linear')
plt.plot(x,x**2,label='Quadratic')
plt.plot(x,x**3,label='Cubic')

plt.xlabel('X-Axis')
plt.ylabel('Y-Axis')
plt.title('Simple Plot')
plt.legend()
plt.show()
```



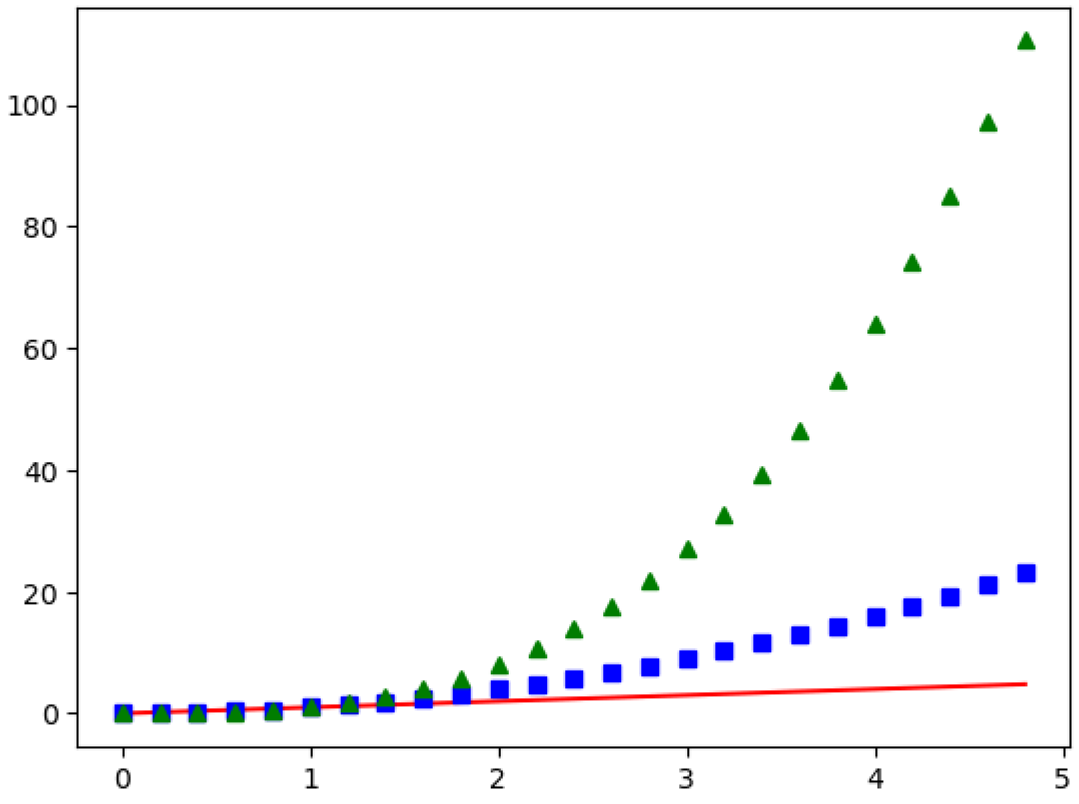
Formatting the style of plot

In [17]:
```
plt.plot([1,2,3,4],[1,4,9,16],'ro')
plt.axis([0,6,0,20])
plt.show()
```



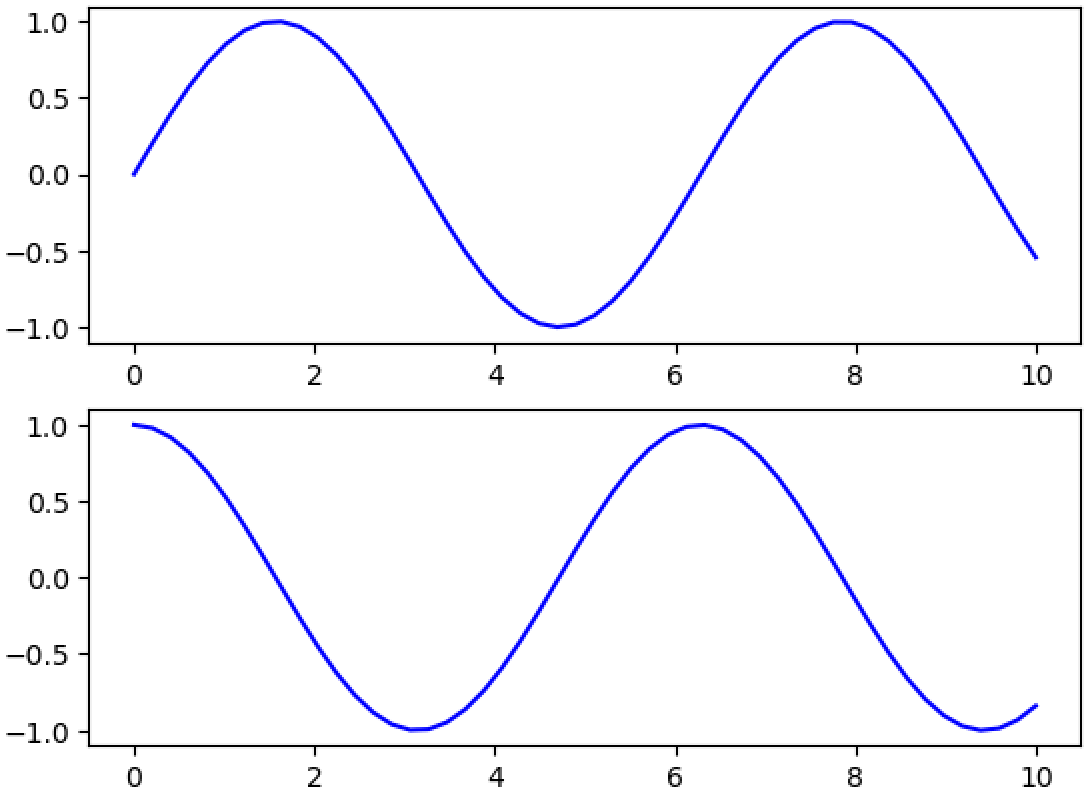
Working with numpy array

```
In [18]: t=np.arange(0.,5.,0.2)
         plt.plot(t,t,'r-',t,t**2,'bs',t,t**3,'g^')
         plt.show()
```



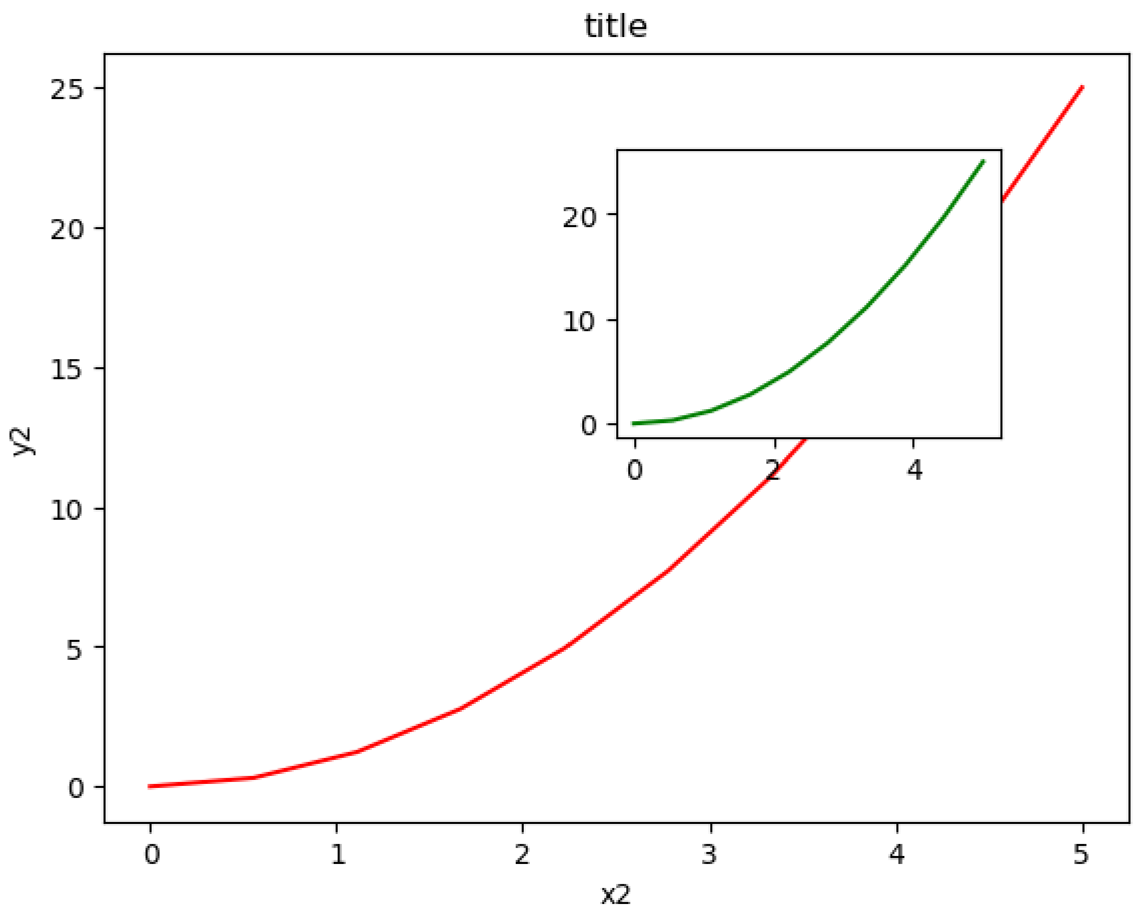
Object-oriented api

```
In [19]: fig,ax=plt.subplots(2)
         ax[0].plot(x1,np.sin(x1),'b-')
         ax[1].plot(x1,np.cos(x1),'b-')
         plt.show()
```



Objects and references

```
In [22]: fig=plt.figure()
         x2=np.linspace(0,5,10)
         y2=x2**2

         main_axes=fig.add_axes([0.1,0.1,0.8,0.8])
         inset_axes=fig.add_axes([0.5,0.5,0.3,0.3])

         main_axes.plot(x2,y2,'r')
         inset_axes.plot(x2,y2,'g')

         main_axes.set_xlabel('x2')
         main_axes.set_ylabel('y2')
         main_axes.set_title('title')
         plt.show()
```



```
In [24]: fig=plt.figure()
         ax=plt.axes()
         plt.show()
```

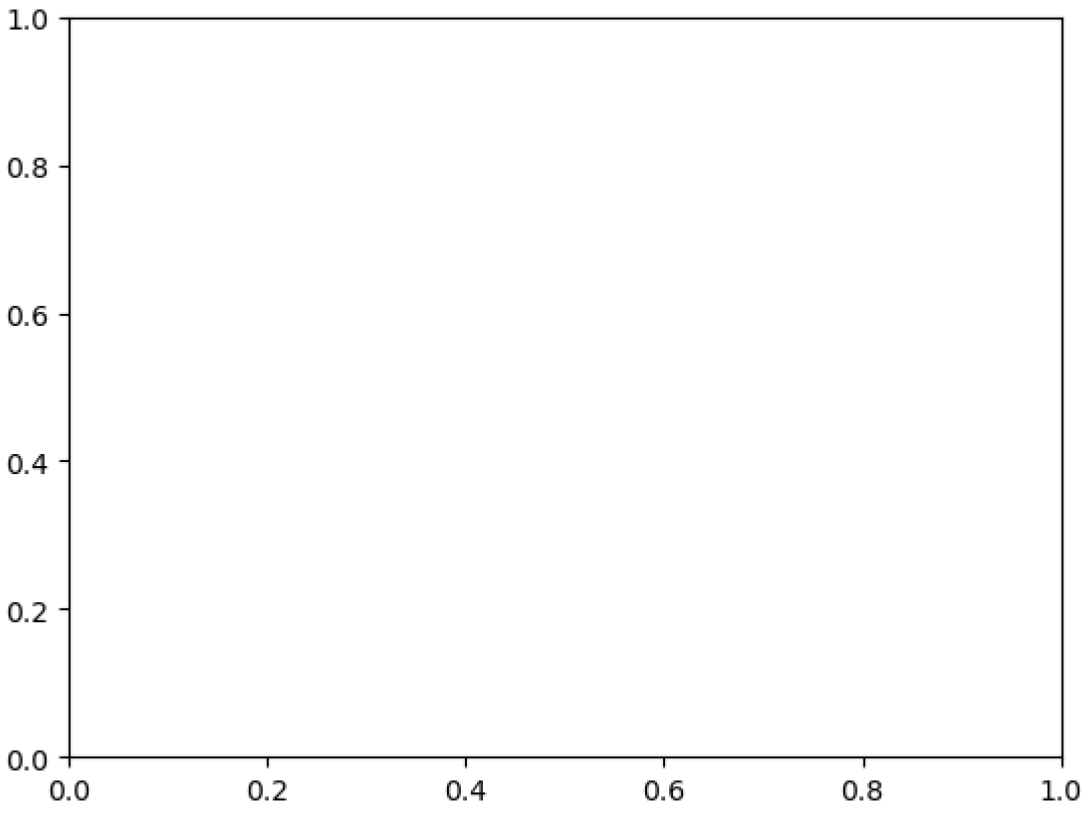
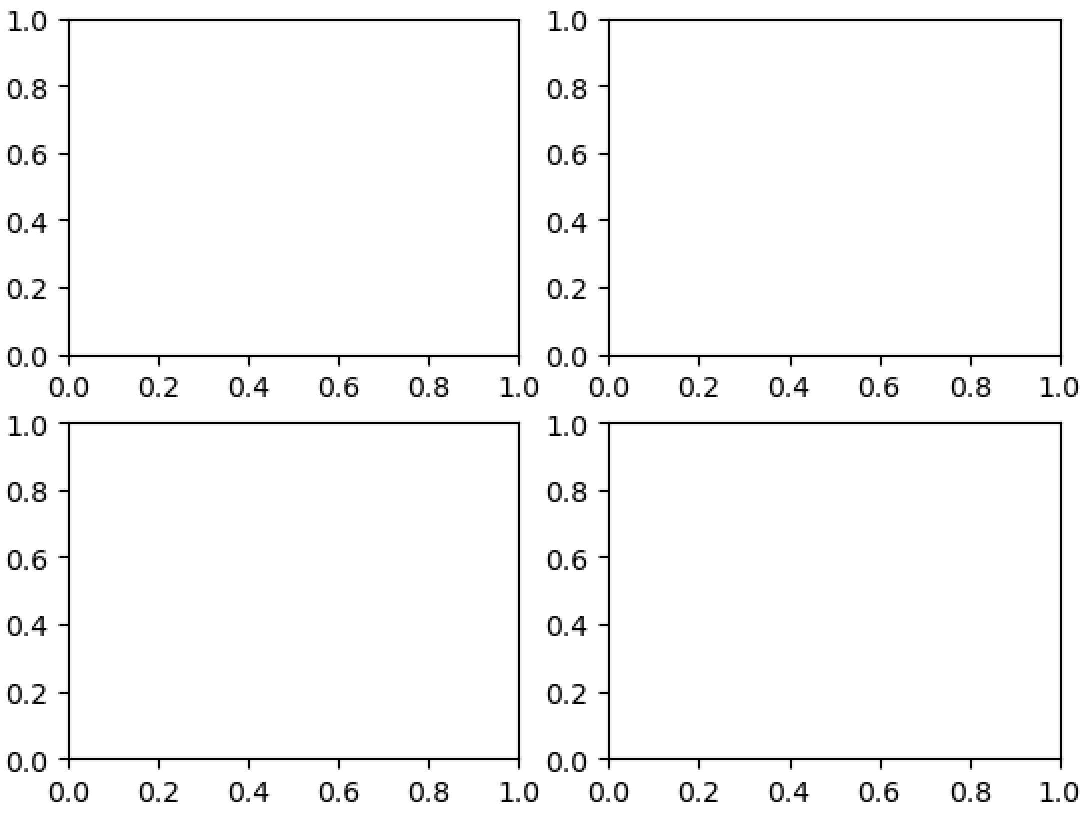


Figure and Subplot

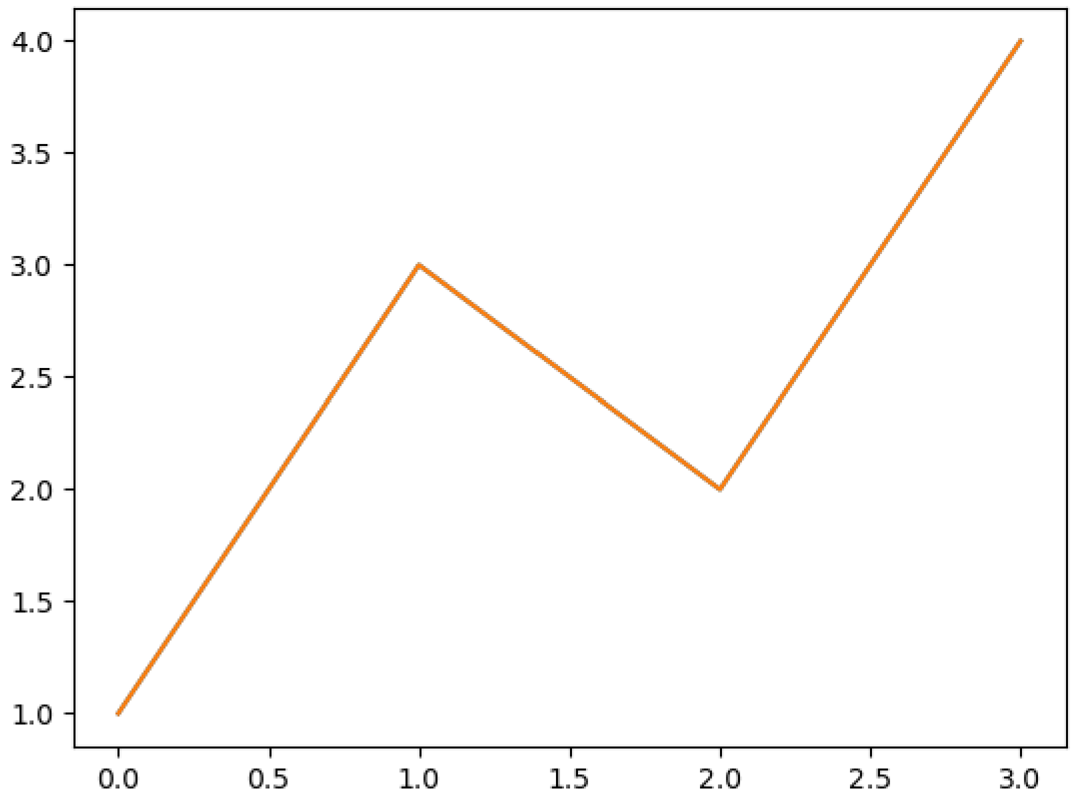
In [25]:
```
fig=plt.figure()
ax1=fig.add_subplot(2,2,1)
ax2=fig.add_subplot(2,2,2)
ax3=fig.add_subplot(2,2,3)
ax4=fig.add_subplot(2,2,4)
```

In [26]:
```
plt.show()
```



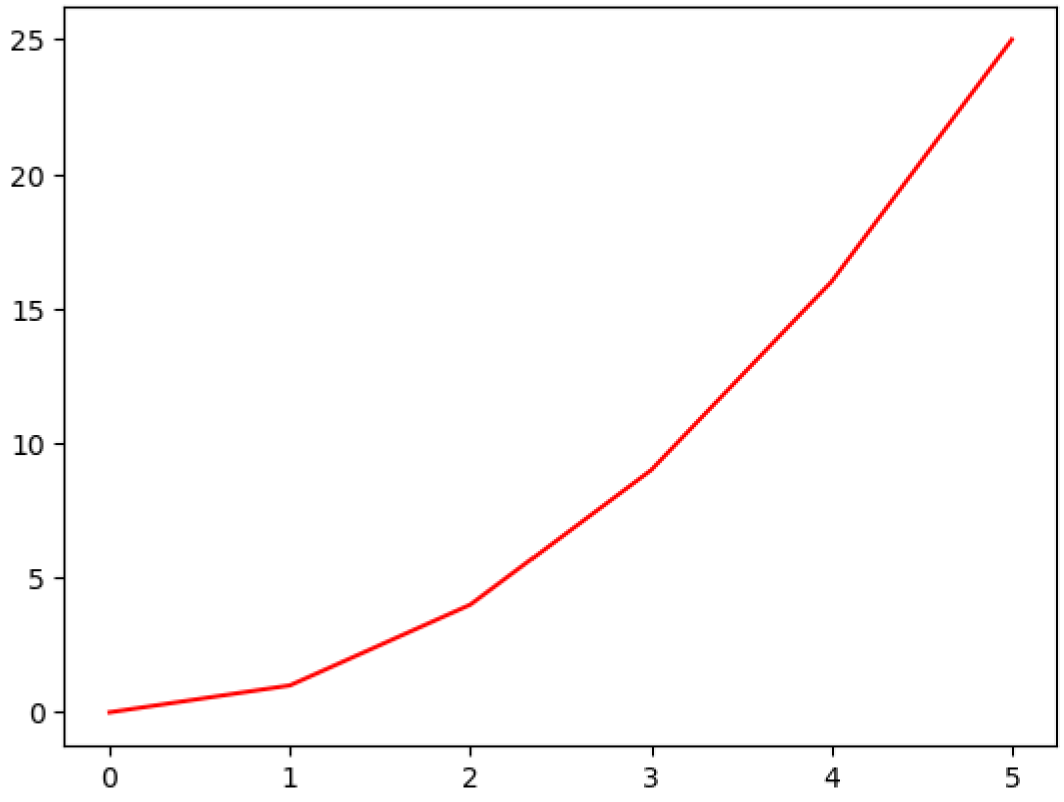
first plot with matplotlib

In [28]:
```
plt.plot([1,3,2,4])
plt.show()
```

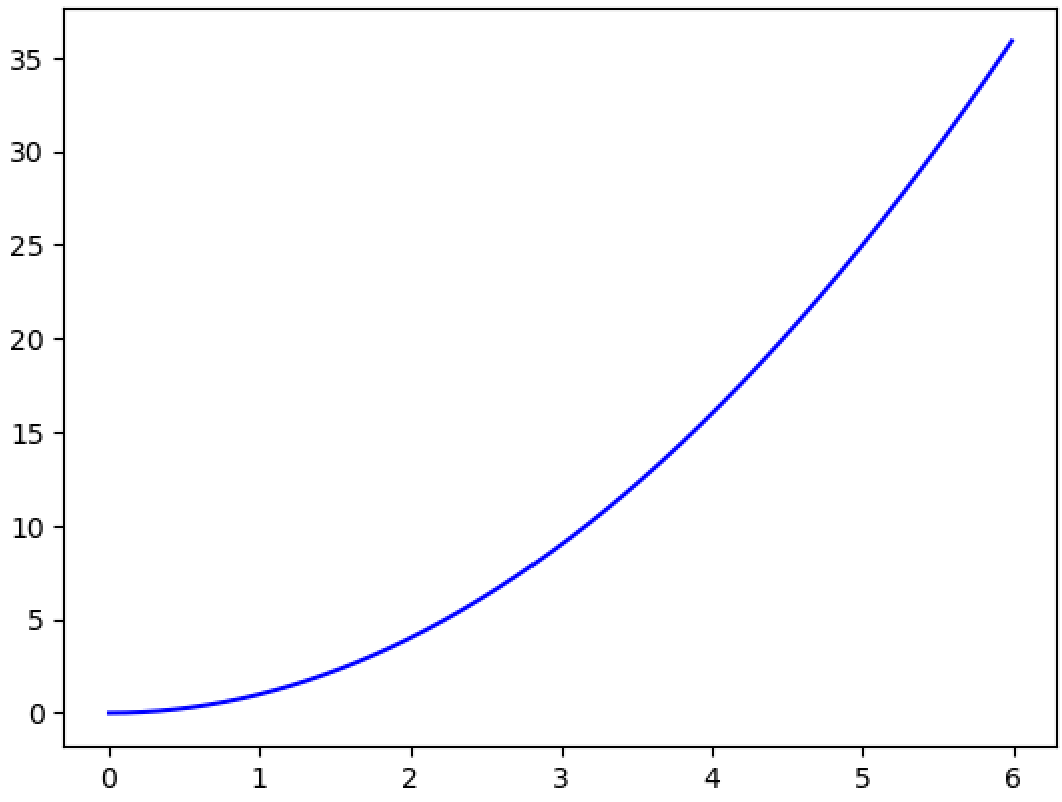


specify both list

In [30]:
```
x3=range(6)
plt.plot(x3,[x1**2 for x1 in x3],'r-')
plt.show()
```

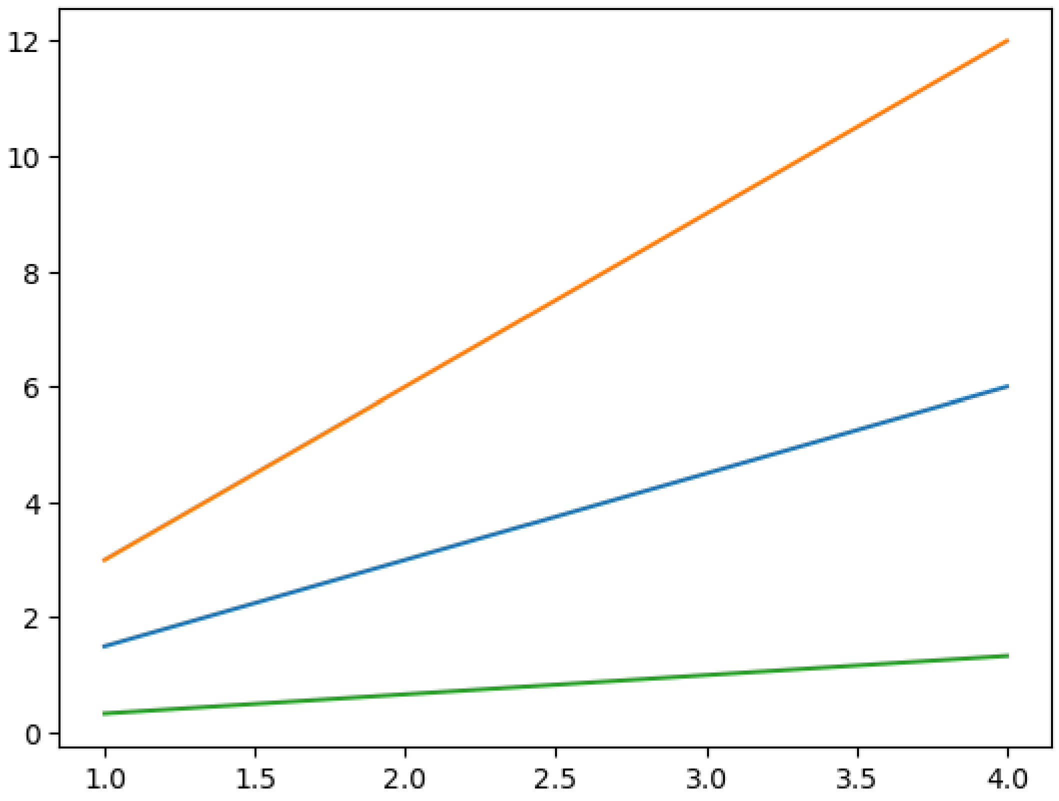


In [32]:
```
x4=np.arange(0.0,6.0,0.01)
plt.plot(x4,[x1**2 for x1 in x4],'b-')
plt.show()
```



Multiline plot

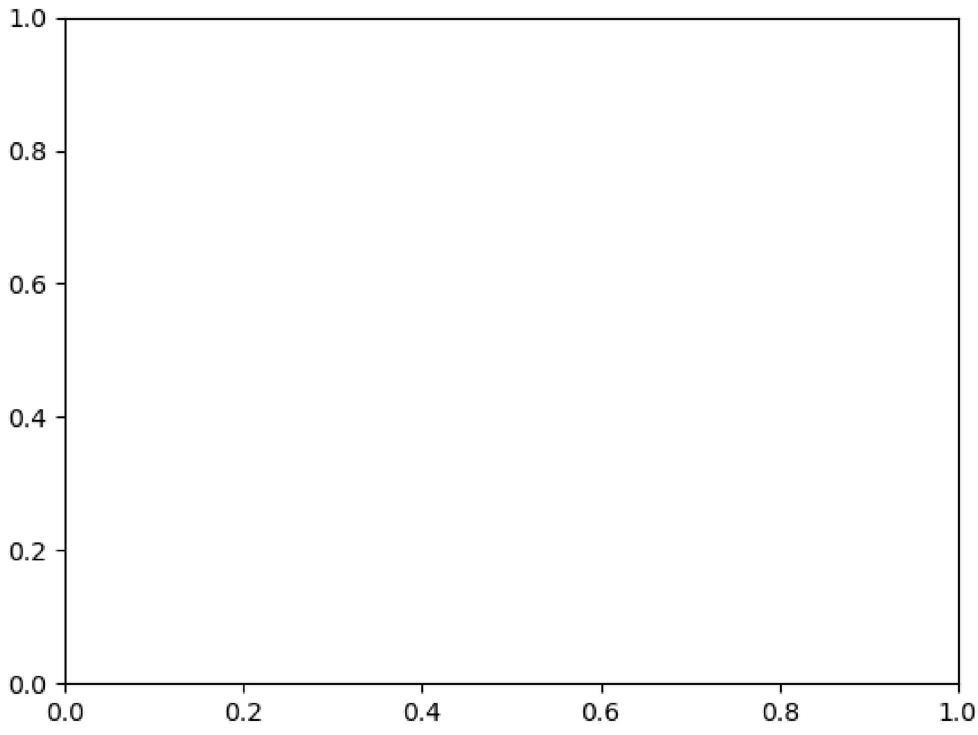
In [33]:
```
x5=range(1,5)

plt.plot(x5,[x1*1.5 for x1 in x5])
plt.plot(x5,[x1*3 for x1 in x5])
plt.plot(x5,[x1/3.0 for x1 in x5])
plt.show()
```



In [40]:
```
fig=plt.figure()
x1=fig.add_subplot(1,1,1)
```

In [43]:
```
fig.savefig('plot1.png')
from IPython.display import Image
Image('plot1.png')
```

Out[43]:

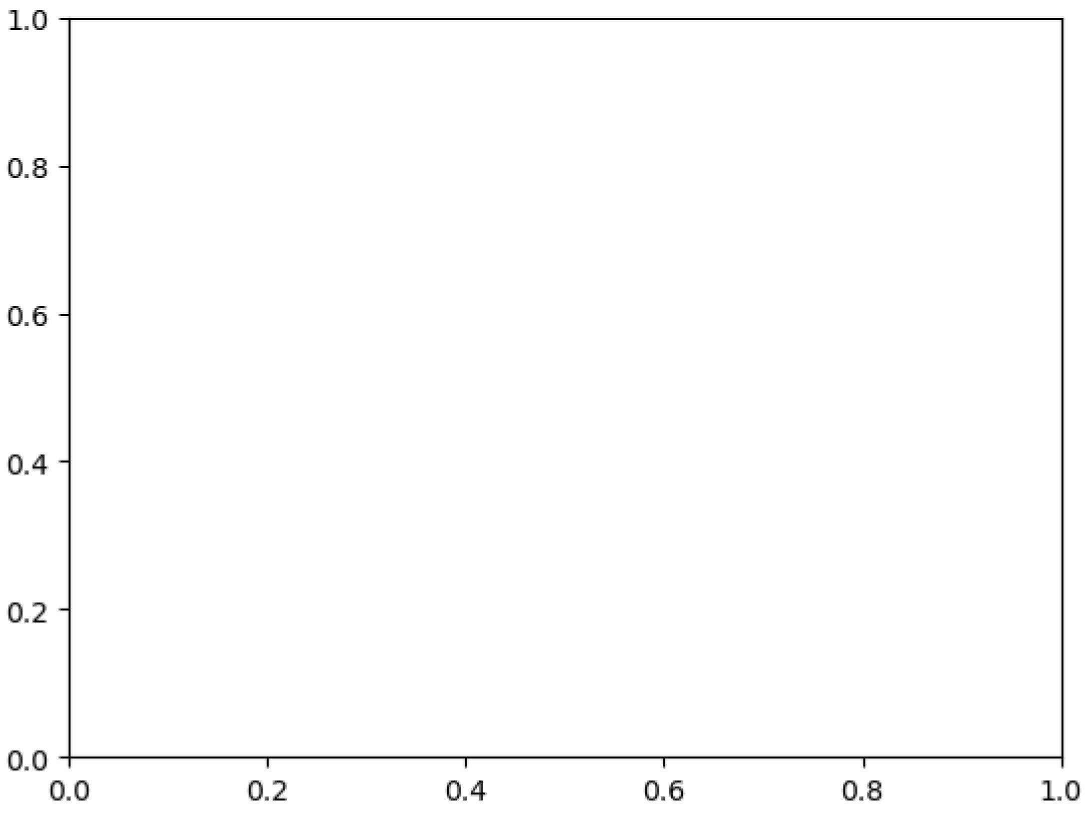


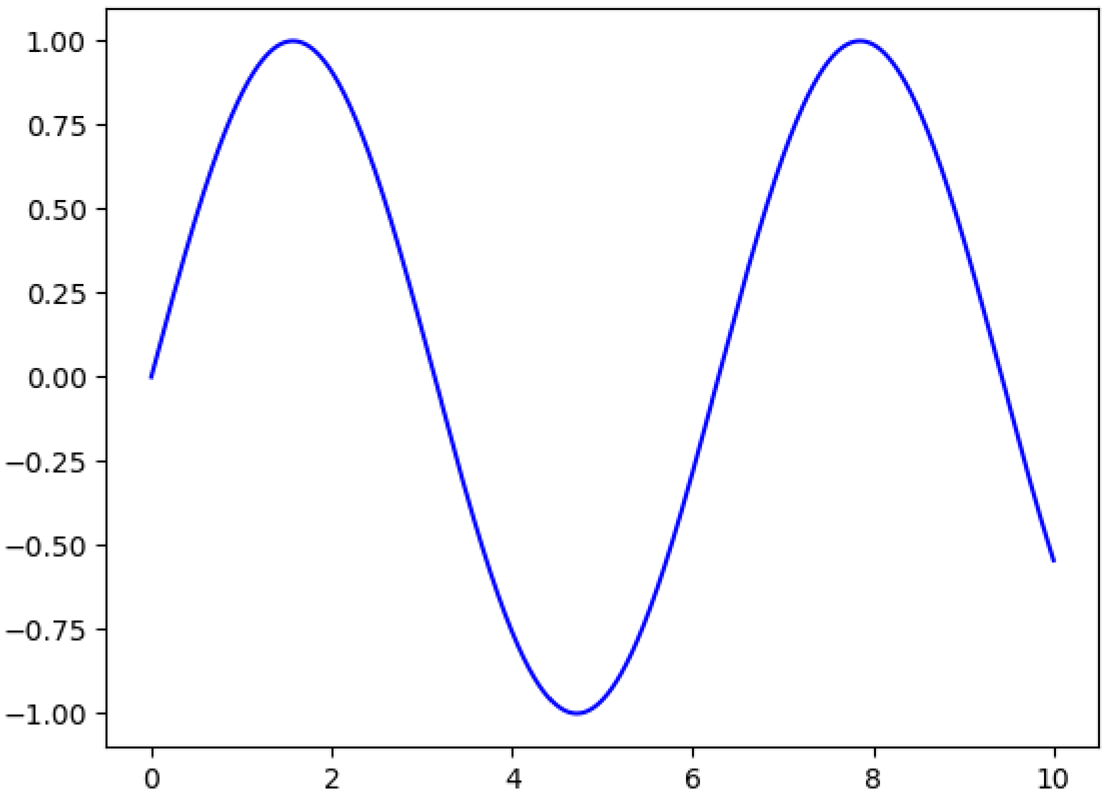
In [44]:
```
fig.canvas.get_supported_filetypes()
```

```
Out[44]: {'eps': 'Encapsulated Postscript',
          'jpg': 'Joint Photographic Experts Group',
          'jpeg': 'Joint Photographic Experts Group',
          'pdf': 'Portable Document Format',
          'pgf': 'PGF code for LaTeX',
          'png': 'Portable Network Graphics',
          'ps': 'Postscript',
          'raw': 'Raw RGBA bitmap',
          'rgba': 'Raw RGBA bitmap',
          'svg': 'Scalable Vector Graphics',
          'svgz': 'Scalable Vector Graphics',
          'tif': 'Tagged Image File Format',
          'tiff': 'Tagged Image File Format',
          'webp': 'WebP Image Format'}
```

Line plot

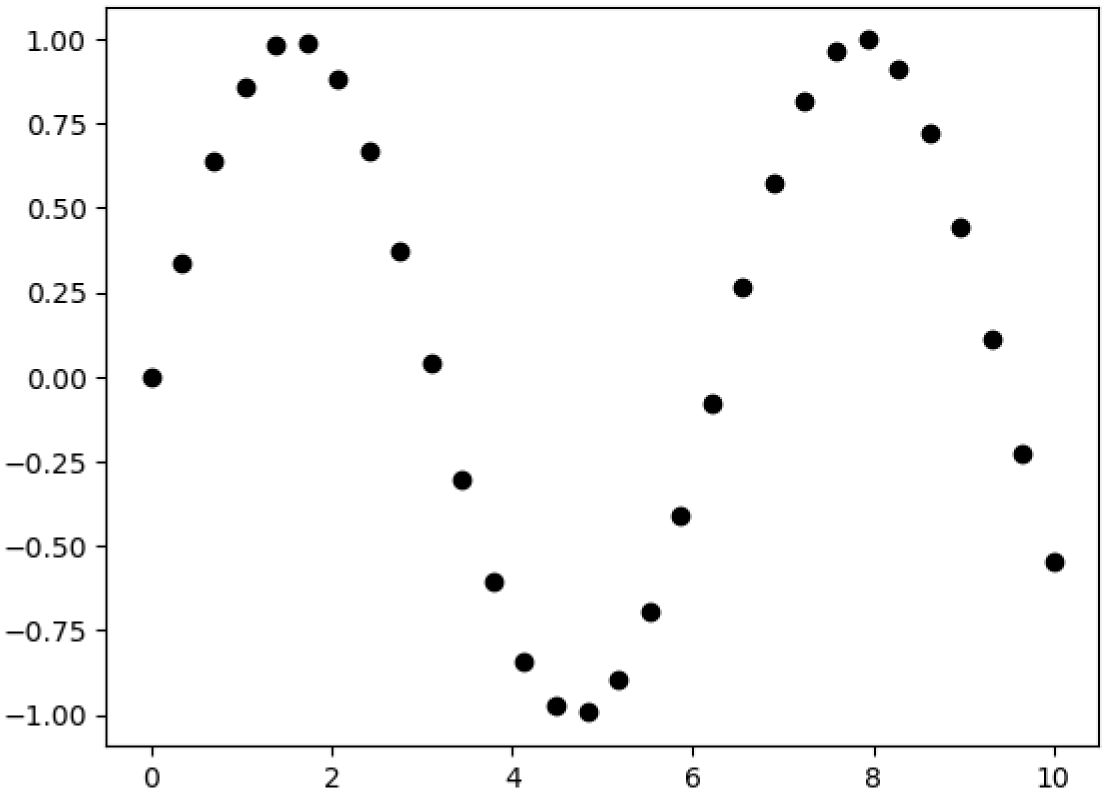
```
In [45]: fig=plt.figure()
         ax=plt.axes()
         x5=np.linspace(0,10,1000)
         ax.plot(x5,np.sin(x5),'b-')
         plt.show()
```





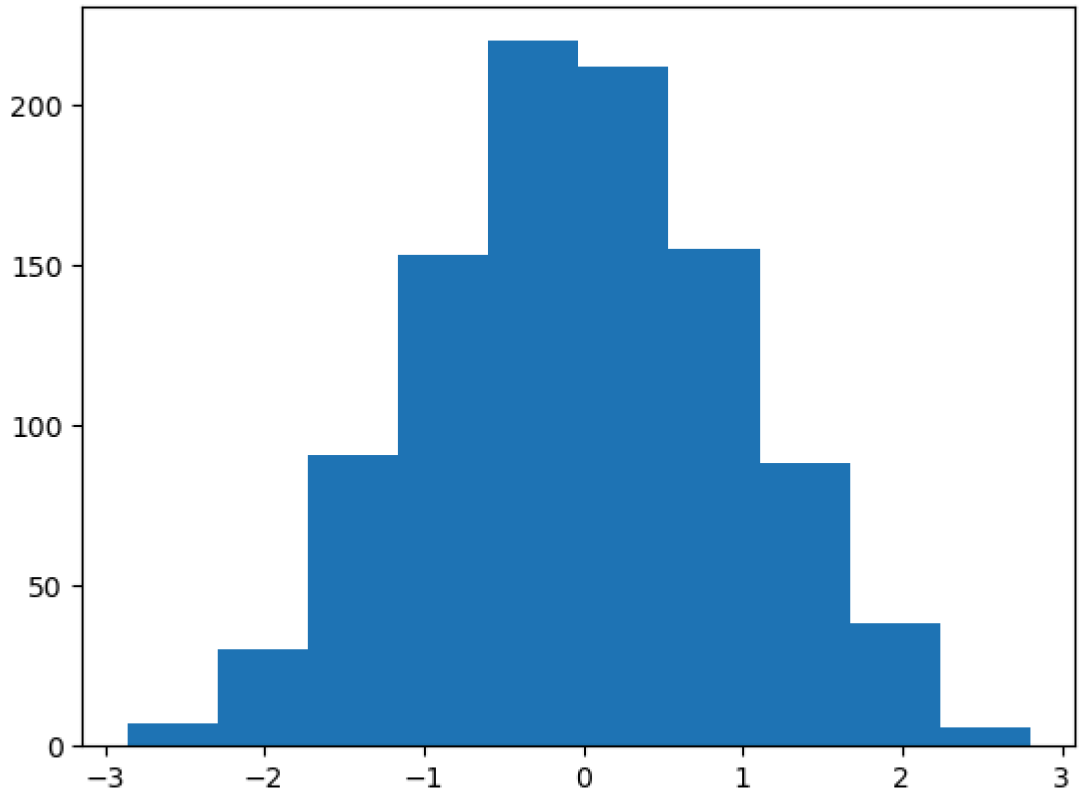
Scatter plot

In [46]:
```
x7=np.linspace(0,10,30)
y7=np.sin(x7)
plt.plot(x7,y7,'o',color='black')
plt.show()
```



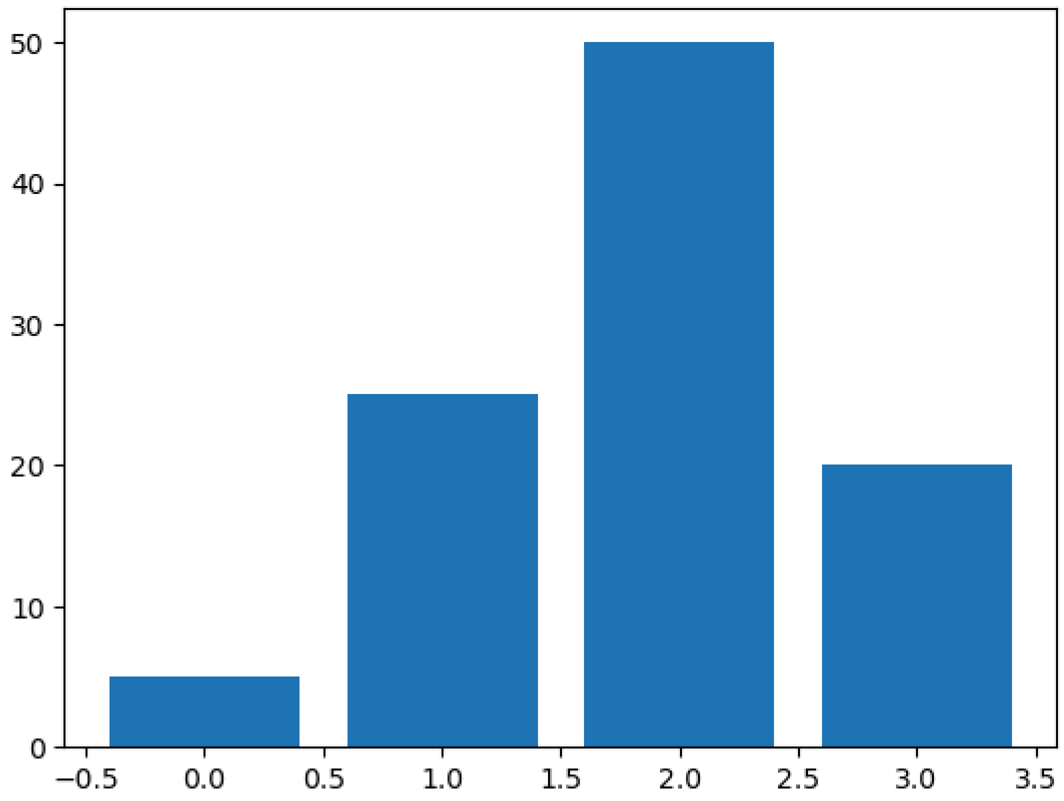
Histogram

In [47]:
```
data1=np.random.randn(1000)
plt.hist(data1)
plt.show()
```



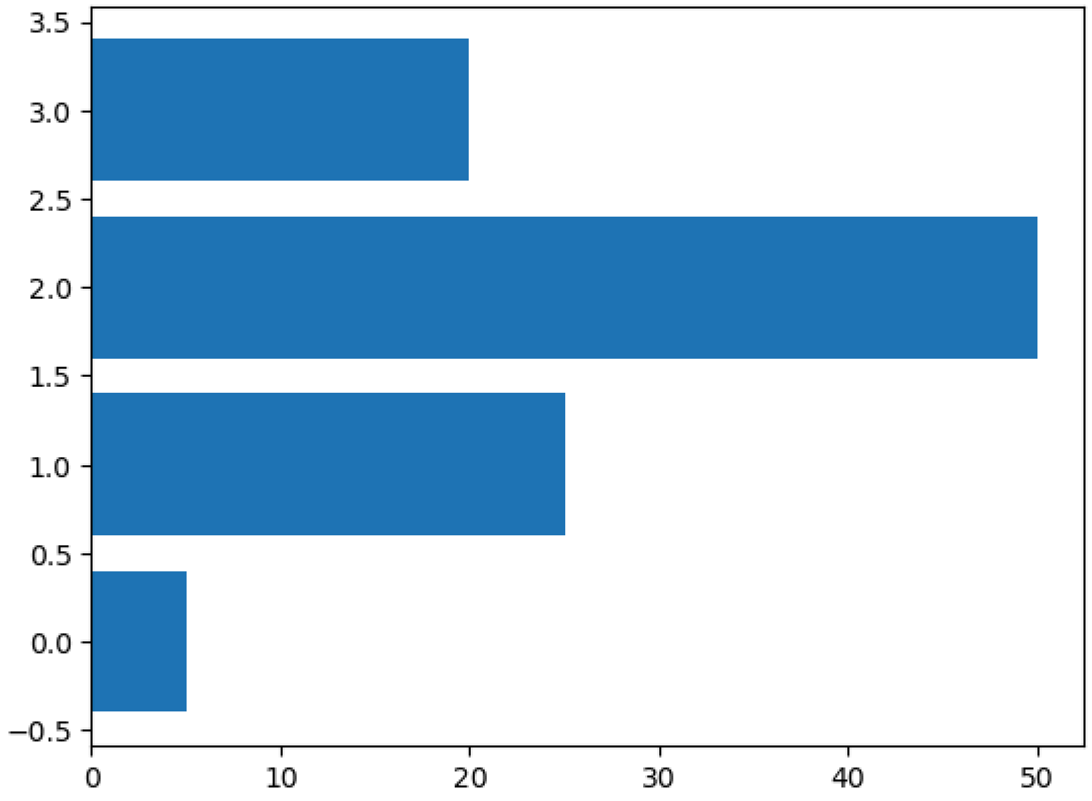
Bar chart

In [48]:
```
data2=[5.,25.,50.,20.]
plt.bar(range(len(data2)),data2)
plt.show()
```



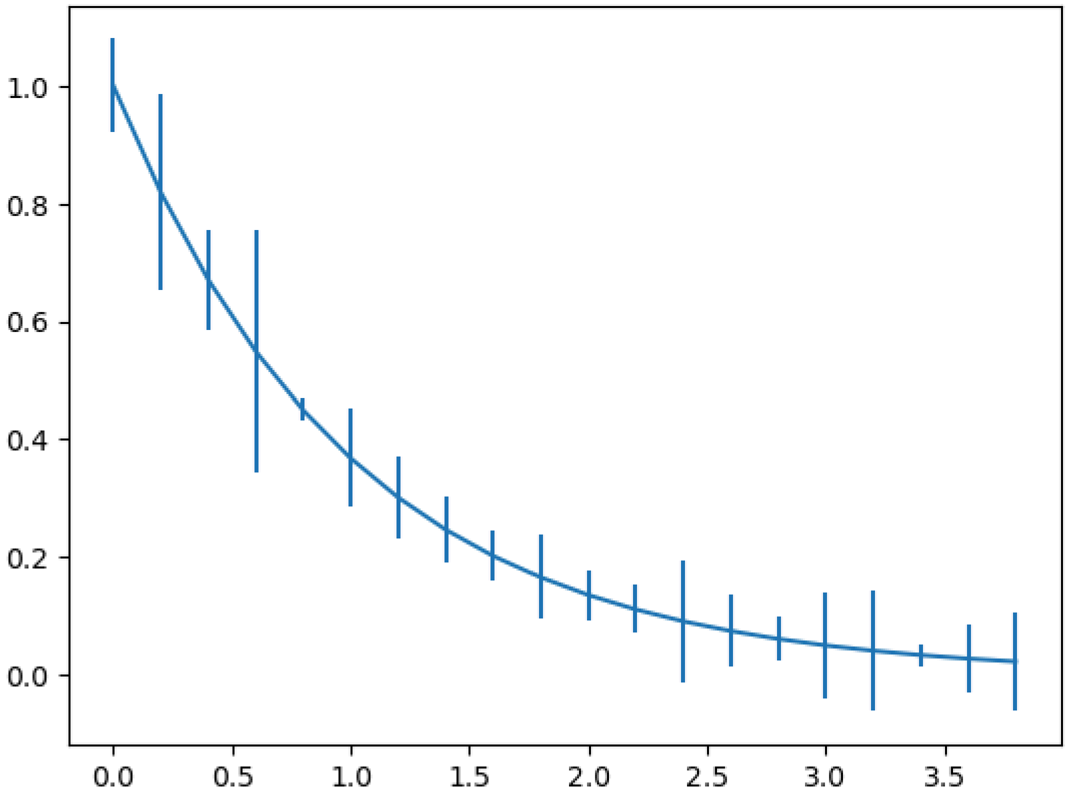
Horizontal bar chart

```
In [49]: data2=[5.,25.,50.,20.]
         plt.barh(range(len(data2)),data2)
         plt.show()
```



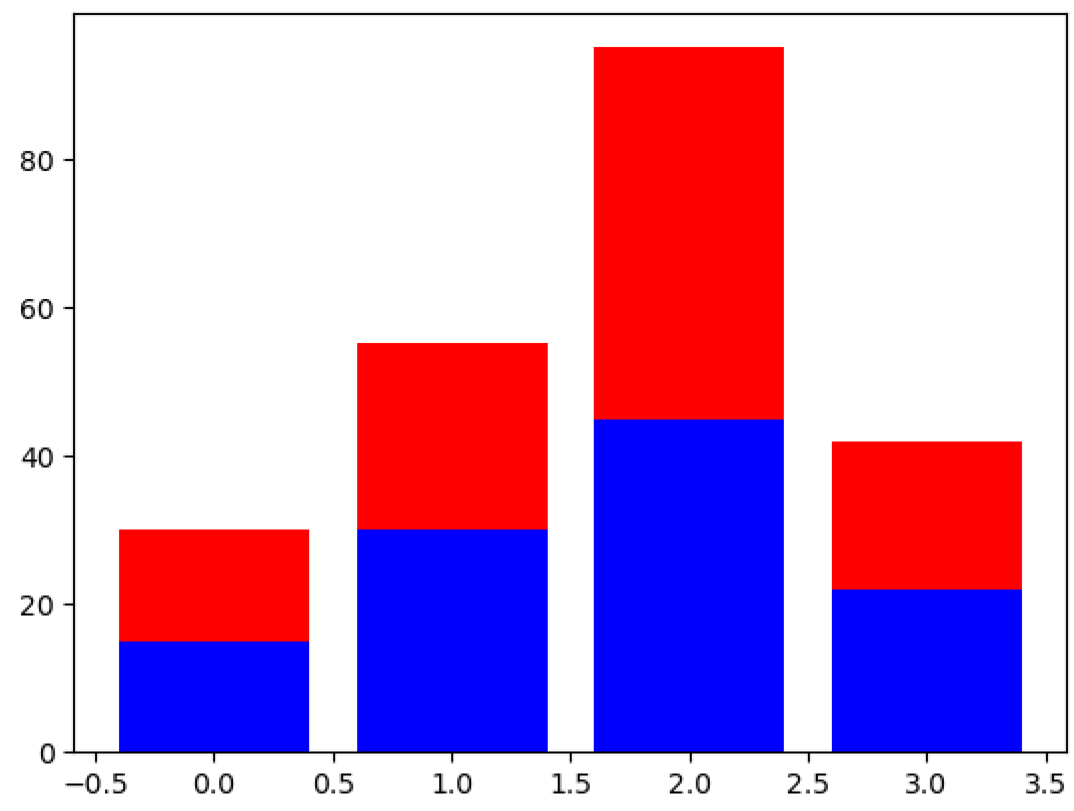
Error Bar chart

In [53]:
```
x9=np.arange(0,4,0.2)
y9=np.exp(-x9)
e1=0.1*np.abs(np.random.randn(len(y9)))
plt.errorbar(x9,y9,yerr=e1,fmt='-')
plt.show()
```



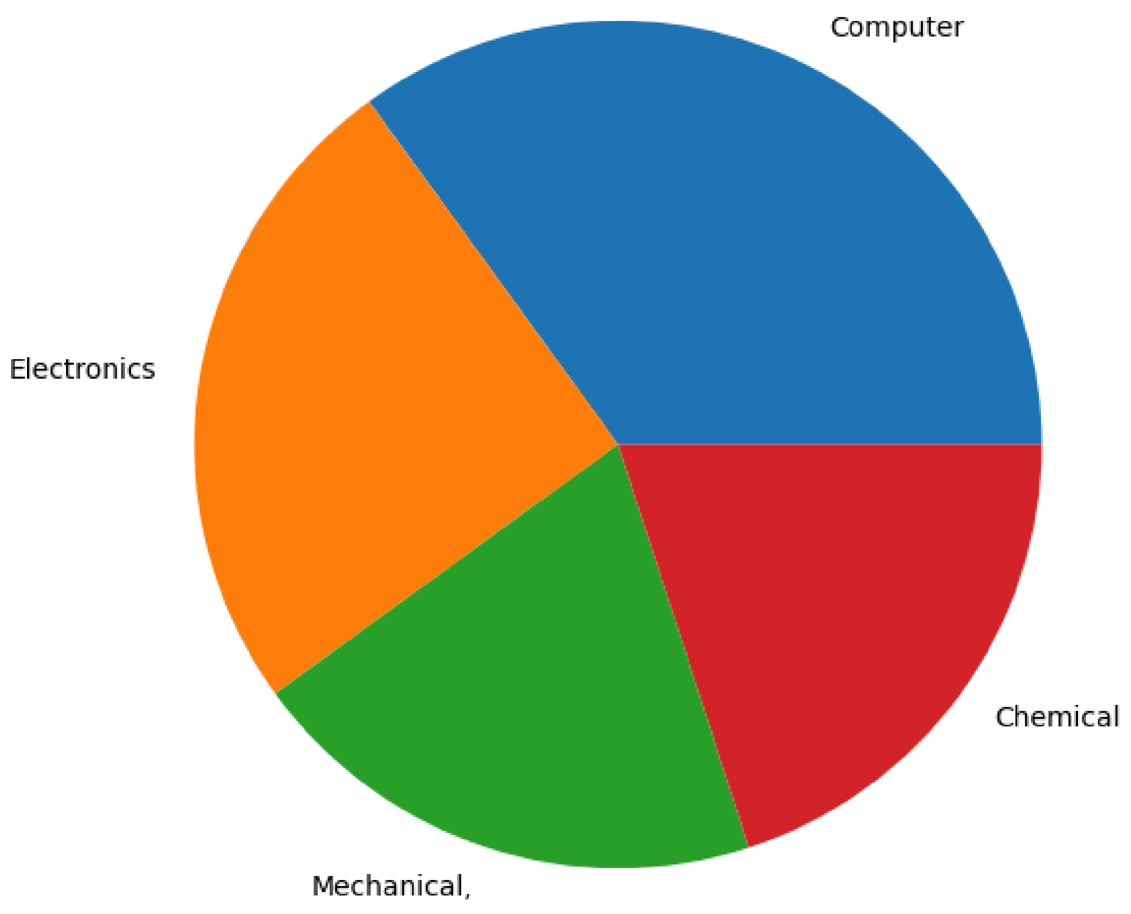
Stacked Bar chart

In [54]:
```
A=[15.,30.,45.,22.]
B=[15.,25.,50.,20.]
z2=range(4)
plt.bar(z2,A,color='b')
plt.bar(z2,B,color='r',bottom=A)
plt.show()
```



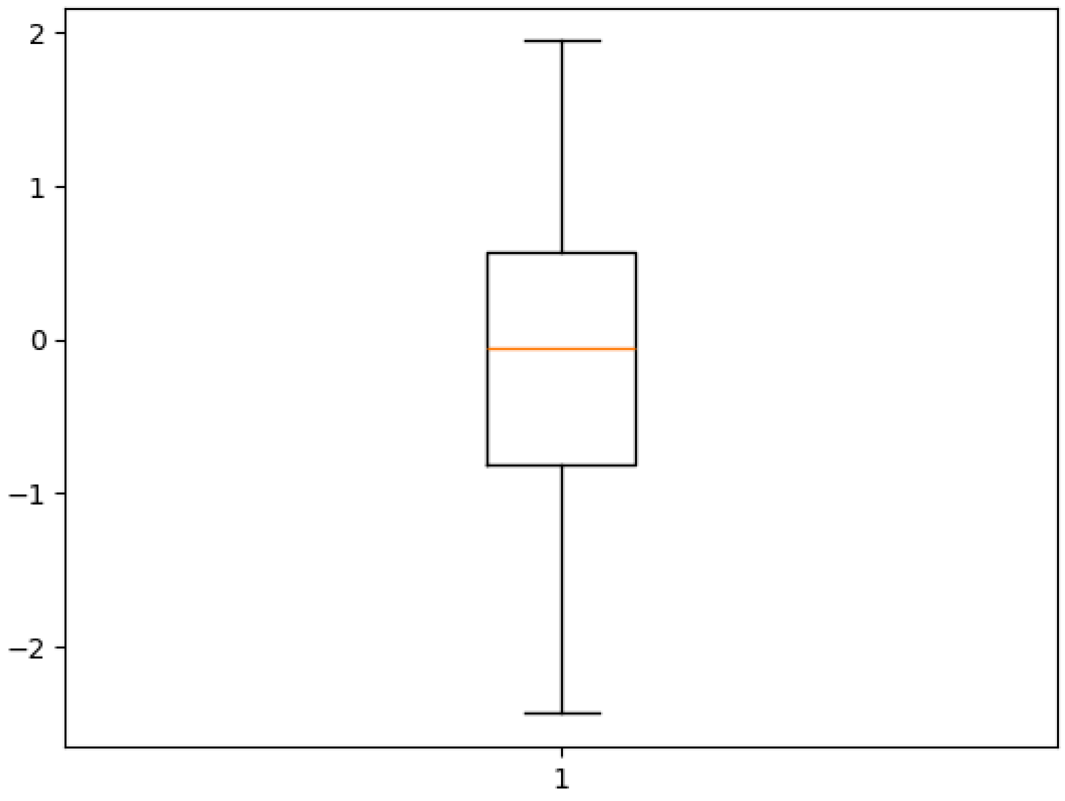
Pie chart

In [56]:
```
plt.figure(figsize=(7,7))
x10=[35,25,20,20]
labels=['Computer','Electronics','Mechanical,','Chemical']
plt.pie(x10,labels=labels)
plt.show()
```



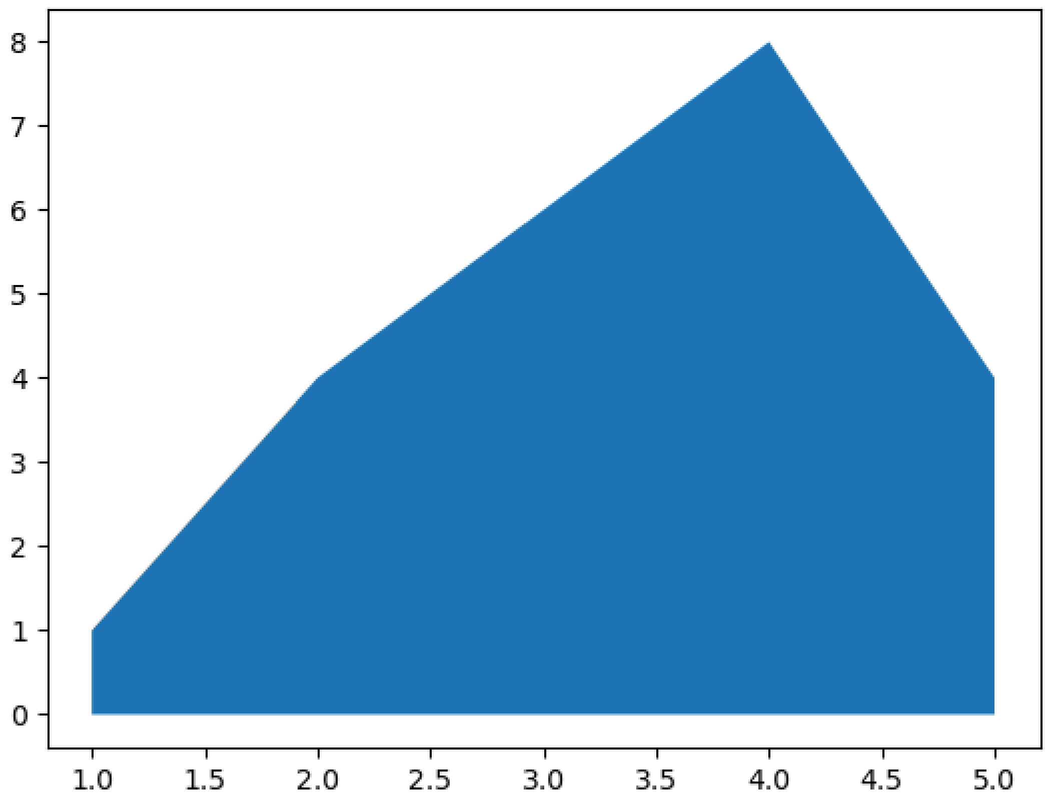
Box Plot

In [57]:
```
data3=np.random.randn(100)
plt.boxplot(data3)
plt.show()
```



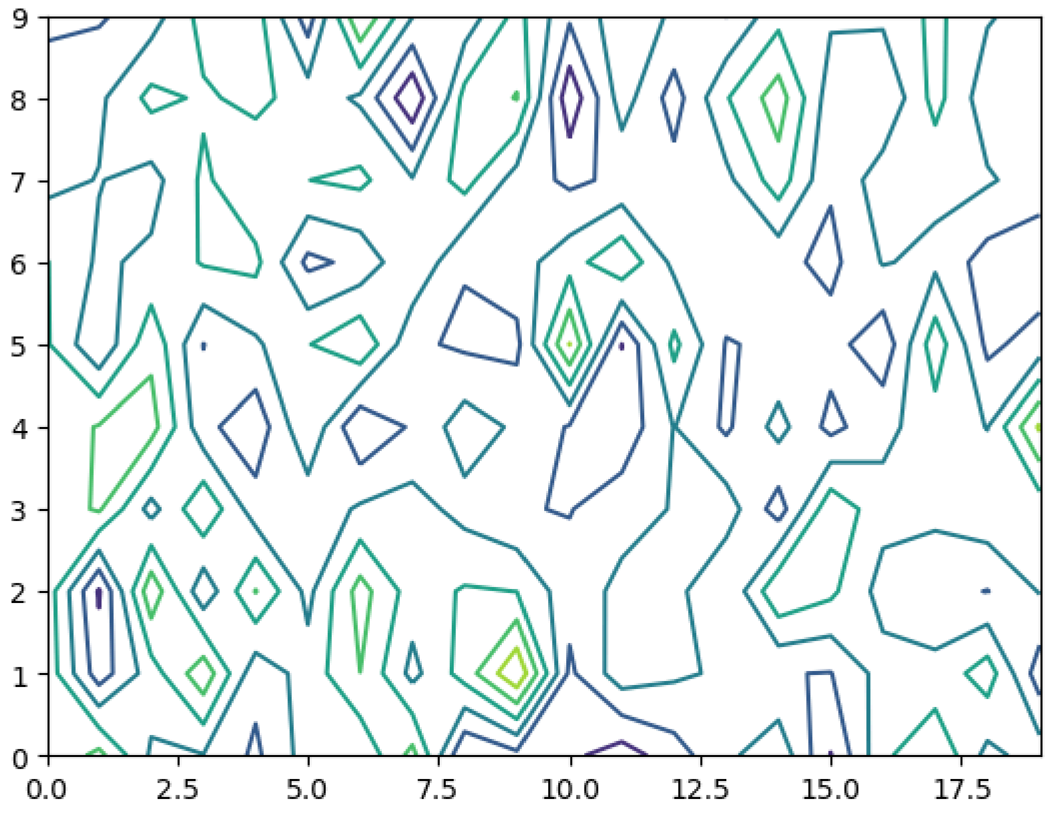
Area Chart

In [58]:
```
x12=range(1,6)
y12=[1,4,6,8,4]
plt.fill_between(x12,y12)
plt.show()
```



Contour plot

In [59]:
```
matrix1=np.random.randn(10,20)
cp=plt.contour(matrix1)
plt.show()
```



Styles with Matplotlib Plots

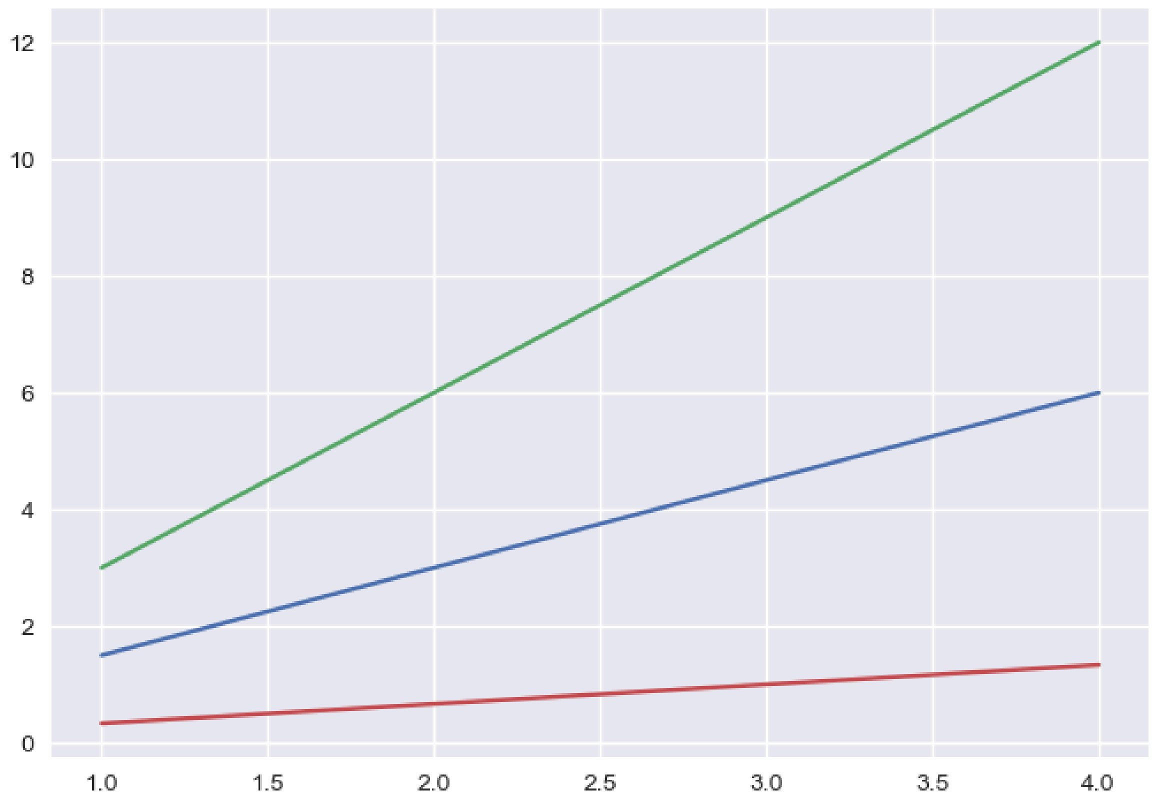
In [60]:
```
print(plt.style.available)
```

```
['Solarize_Light2', '_classic_test_patch', '_mpl-gallery', '_mpl-gallery-nogrid',
'bmh', 'classic', 'dark_background', 'fast', 'fivethirtyeight', 'ggplot', 'graysc
ale', 'petroff10', 'seaborn-v0_8', 'seaborn-v0_8-bright', 'seaborn-v0_8-colorblin
d', 'seaborn-v0_8-dark', 'seaborn-v0_8-dark-palette', 'seaborn-v0_8-darkgrid', 's
eaborn-v0_8-deep', 'seaborn-v0_8-muted', 'seaborn-v0_8-notebook', 'seaborn-v0_8-p
aper', 'seaborn-v0_8-pastel', 'seaborn-v0_8-poster', 'seaborn-v0_8-talk', 'seabor
n-v0_8-ticks', 'seaborn-v0_8-white', 'seaborn-v0_8-whitegrid', 'tableau-colorblin
d10']
```

In [61]:
```
plt.style.use('seaborn-v0_8')
```

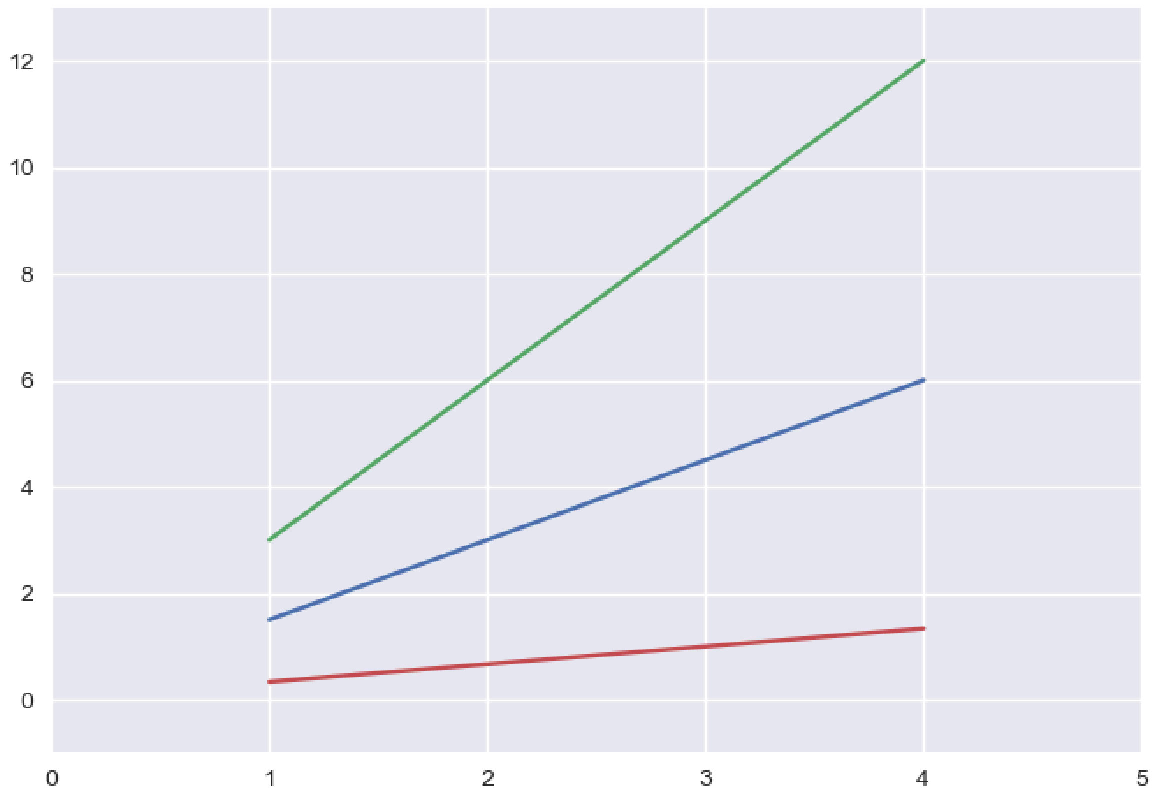
Adding a Grid

In [62]:
```
x15=np.arange(1,5)
plt.plot(x15,x15*1.5,x15,x15*3.0,x15,x15/3.0)
plt.grid(True)
plt.show()
```

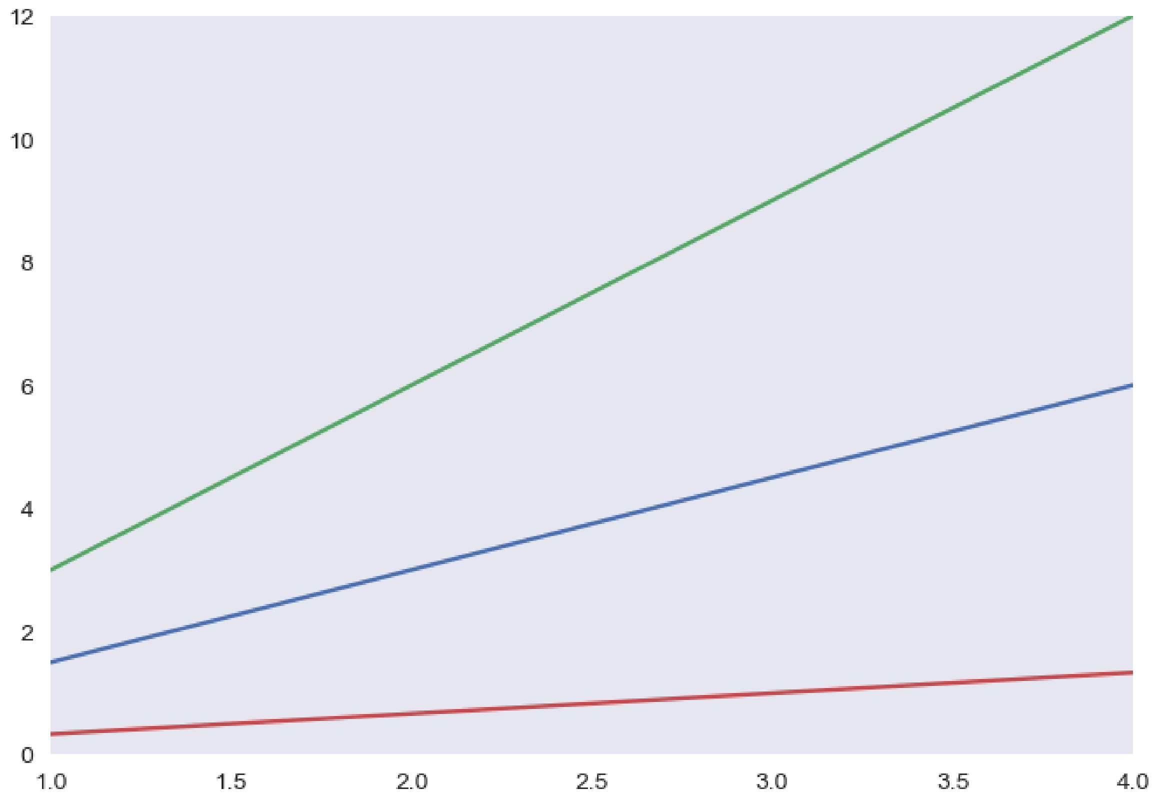


Handling axes

In [63]:
```
x15=np.arange(1,5)
plt.plot(x15,x15*1.5,x15,x15*3.0,x15,x15/3.0)
plt.axis()
plt.axis([0,5,-1,13])
plt.show()
```

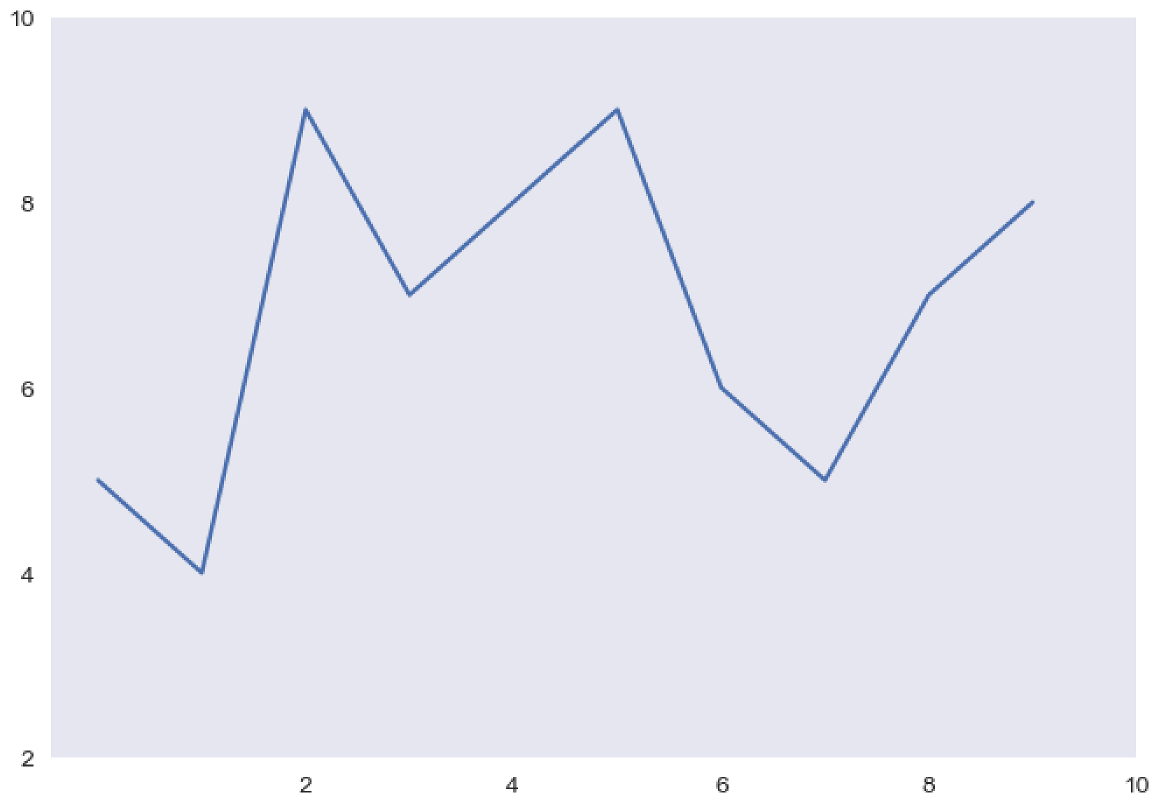


In [64]:
```
x15=np.arange(1,5)
plt.plot(x15,x15*1.5,x15,x15*3.0,x15,x15/3.0)
plt.xlim([1.0,4.0])
plt.ylim([0.0,12.0])
plt.grid(False)
plt.show()
```



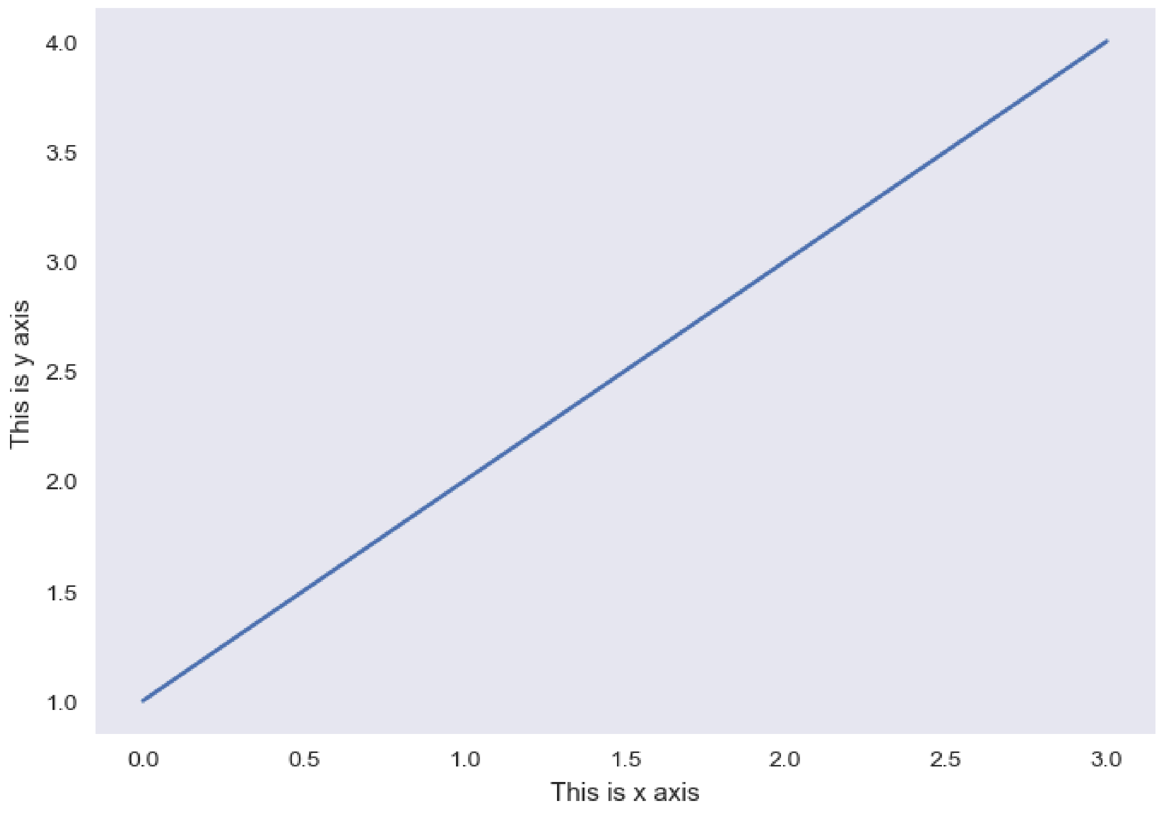
Handling X and Y ticks

In [65]:
```
u=[5,4,9,7,8,9,6,5,7,8]
plt.plot(u)
plt.xticks([2,4,6,8,10])
plt.yticks([2,4,6,8,10])
plt.grid(False)
plt.show()
```



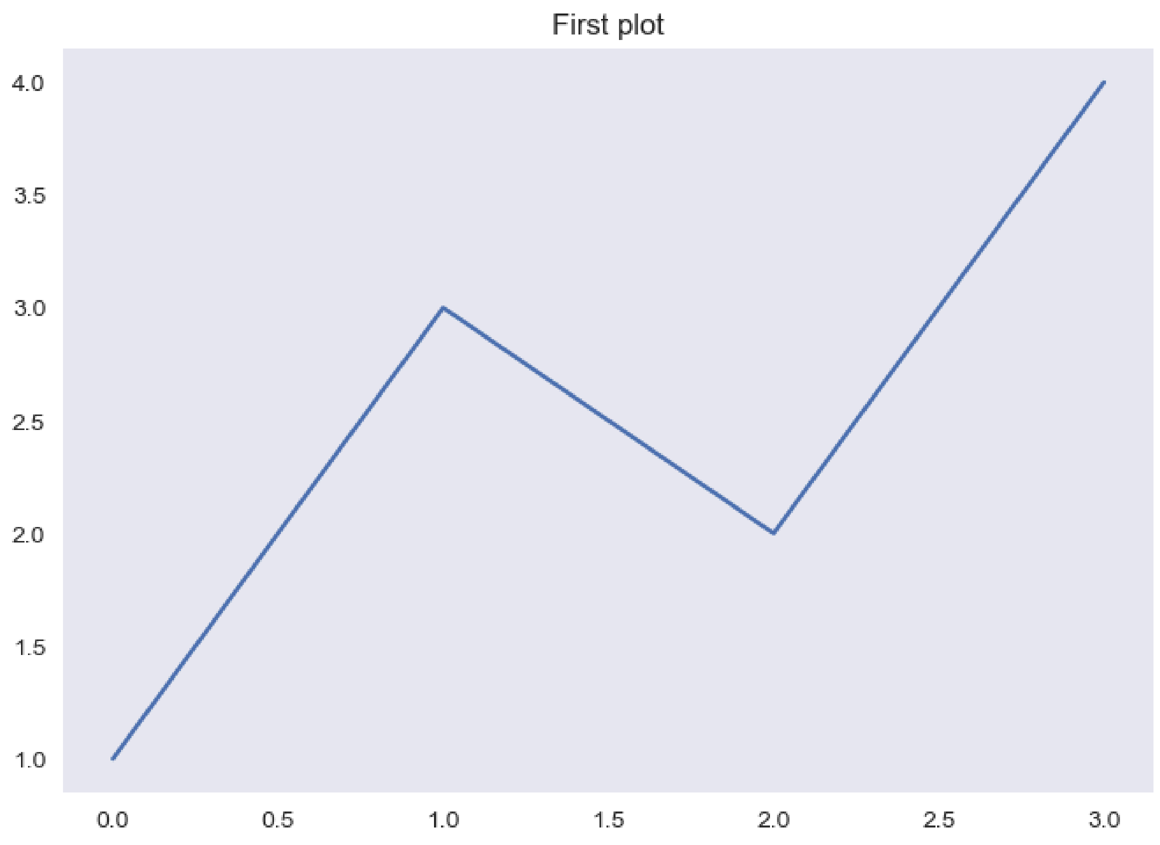
Adding labels

In [66]:
```
plt.plot([1,2,3,4])
plt.xlabel('This is x axis')
plt.ylabel('This is y axis')
plt.grid()
plt.show()
```



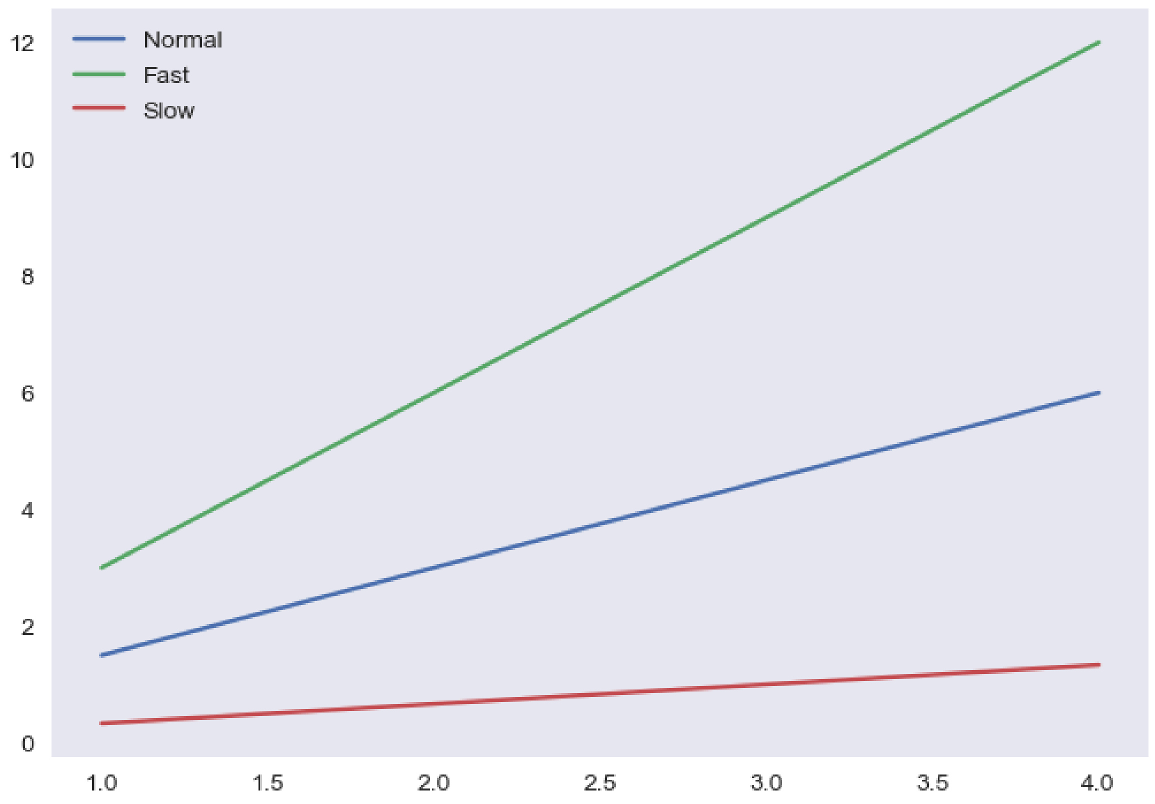
Adding title

In [67]:
```
plt.plot([1,3,2,4])
plt.title('First plot')
plt.grid(None)
plt.show()
```

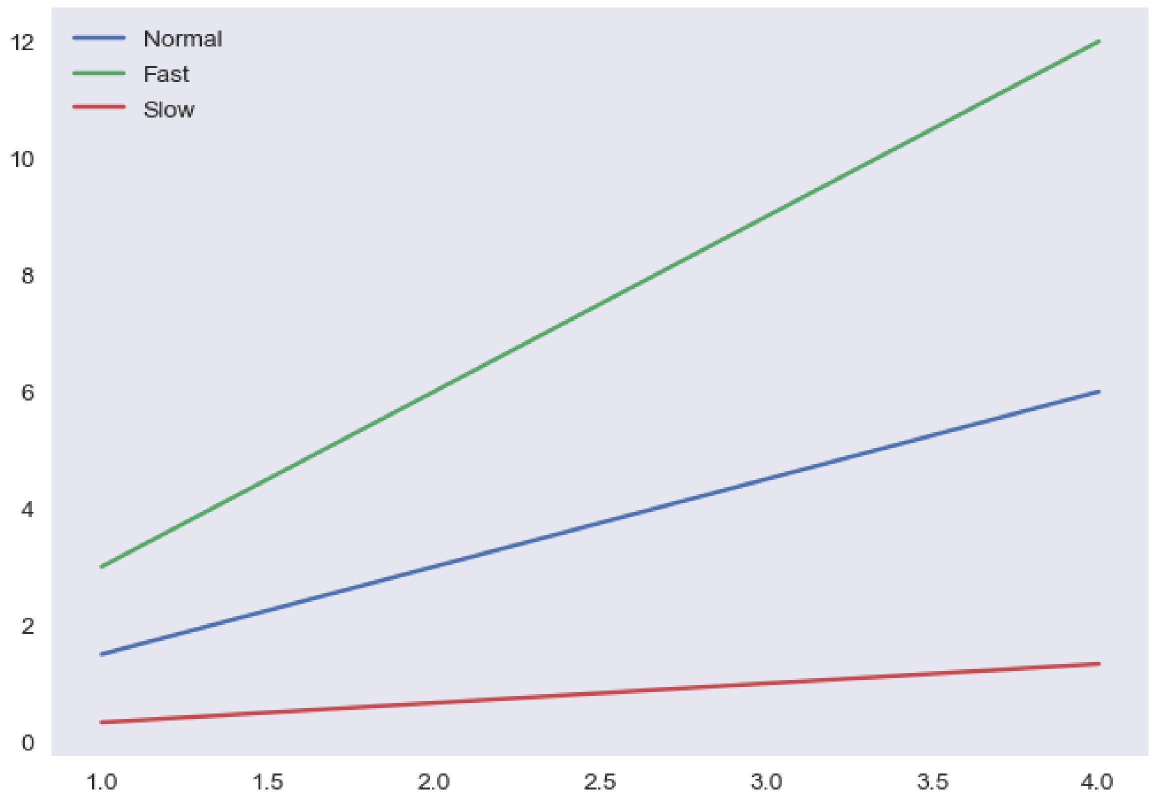


Adding legends

In [70]:
```
x15=np.arange(1,5)
fig,ax=plt.subplots()
ax.plot(x15,x15*1.5)
ax.plot(x15,x15*3.0)
ax.plot(x15,x15/3.0)
ax.legend(['Normal','Fast','Slow'])
plt.grid()
plt.show()
```

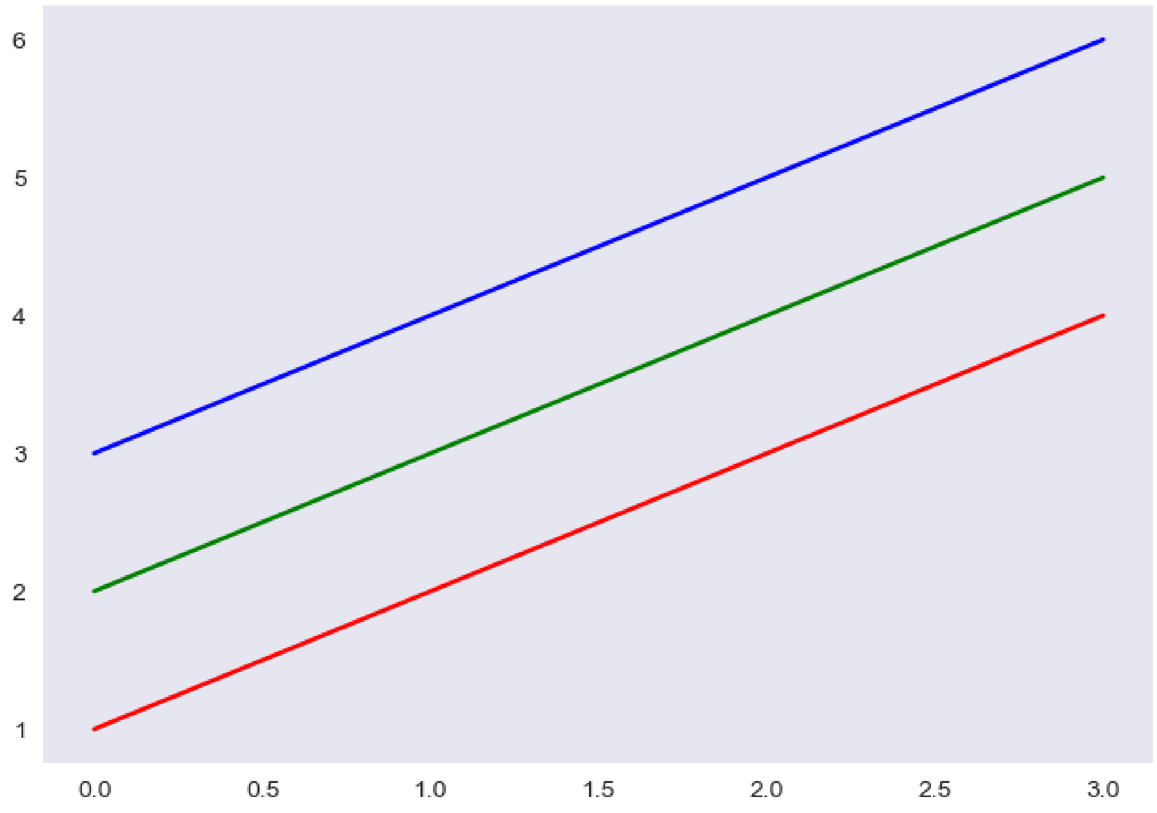


```
In [71]: x15=np.arange(1,5)
         fig,ax=plt.subplots()
         ax.plot(x15,x15*1.5,label='Normal')
         ax.plot(x15,x15*3.0,label='Fast')
         ax.plot(x15,x15/3.0,label='Slow')
         ax.legend()
         plt.grid()
         plt.show()
```



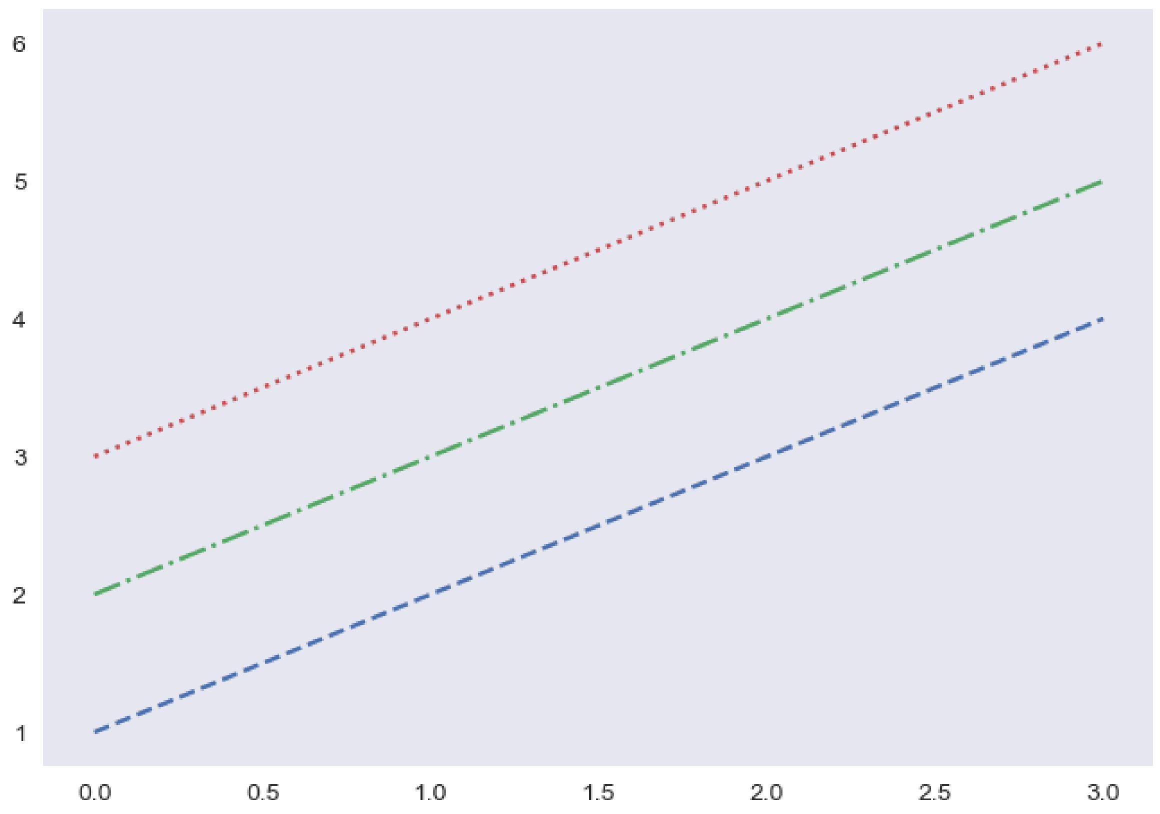
Control colours

```
In [75]: x16=np.arange(1,5)
         plt.plot(x16,'r')
         plt.plot(x16+1,'g')
         plt.plot(x16+2,'b')
         plt.grid()
         plt.show()
```



Control line Styles

```
In [76]: x16=np.arange(1,5)
         plt.plot(x16,'--',x16+1,'-.',x16+2,':')
         plt.grid()
         plt.show()
```



```
In [ ]:
```