```
%matplotlib inline
import numpy as np
import matplotlib.pyplot as plt
from pylab import *
%config ZMQInteractiveShell.ast_node_interactivity='all'
%pprint
```

```
Pretty printing has been turned OFF
```

```
#coding:utf-8

# 定义数据部分
x = np.arange(0., 10, 0.2)
y1 = np.cos(x)
y2 = np.sin(x)
y3 = np.sqrt(x)

# 绘制 3 条函数曲线
plt.plot(x, y1, color='blue', linewidth=1.5, linestyle='-', marker='.'
, label=r'$y = cos{x}$')
plt.plot(x, y2, color='green', linewidth=1.5, linestyle='-', marker='*
', label=r'$y = sin{x}$')
plt.plot(x, y3, color='m', linewidth=1.5, linestyle='-', marker='x', l
abel=r'$y = \sqrt{x}$')

# 坐标轴上移
ax = plt.subplot(111)
ax.spines['right'].set_color('none')     # 去掉右边的边框线
ax.spines['top'].set_color('none')       # 去掉上边的边框线

# 移动下边边框线，相当于移动 x 轴
ax.xaxis.set_ticks_position('bottom')
ax.spines['bottom'].set_position(('data', 0))

# 移动左边边框线，相当于移动 y 轴
ax.yaxis.set_ticks_position('left')
ax.spines['left'].set_position(('data', 0))

# 设置 x, y 轴的取值范围
plt.xlim(x.min()*1.1, x.max()*1.1)
plt.ylim(-1.5, 4.0)
```

```
# 设置 x, y 轴的刻度值
plt.xticks([2, 4, 6, 8, 10], [r'2', r'4', r'6', r'8', r'10'])
plt.yticks([-1.0, 0.0, 1.0, 2.0, 3.0, 4.0],
    [r'-1.0', r'0.0', r'1.0', r'2.0', r'3.0', r'4.0'])

# 添加文字
plt.text(8, 1.5, r'$x \in [0.0, \ 10.0]$', color='k', fontsize=15)
plt.text(8, 1.8, r'$y \in [-1.0, \ 4.0]$', color='k', fontsize=15)

# 特殊点添加注解
plt.scatter([8,],[np.sqrt(8),], 50, color ='m')  # 使用散点图放大当前点
plt.annotate(r'$2\sqrt{2}$', xy=(8, np.sqrt(8)), xytext=(8.5, 2.2), fo
ntsize=16, color='#090909', arrowprops=dict(arrowstyle='->', connectio
nstyle='arc3, rad=0.1', color='#090909'))

# 设置标题、x轴、y轴
plt.title(r'$the \ function \ figure \ of \ cos(), \ sin() \ and \ sqr
t()$', fontsize=19)
plt.xlabel(r'$the \ input \ value \ of \ x$', fontsize=18, labelpad=88
.8)
plt.ylabel(r'$y = f(x)$', fontsize=18, labelpad=12.5)

# 设置图例及位置
plt.legend(loc='best')
# plt.legend(['cos(x)', 'sin(x)', 'sqrt(x)'], loc='up right')

# 显示网格线
plt.grid(True)

# 显示绘图
plt.show()
```

```
[<matplotlib.lines.Line2D object at 0x129958510>]






[<matplotlib.lines.Line2D object at 0x129958b50>]






[<matplotlib.lines.Line2D object at 0x129282610>]
```

```
/Users/flybird/opt/anaconda3/lib/python3.7/site-packages/ipykernel_lau
ncher.py:15: MatplotlibDeprecationWarning: Adding an axes using the sa
me arguments as a previous axes currently reuses the earlier instance.
  In a future version, a new instance will always be created and retur
ned.  Meanwhile, this warning can be suppressed, and the future behavi
or ensured, by passing a unique label to each axes instance.
  from ipykernel import kernelapp as app
```

```
(0.0, 10.780000000000001)
```

```
(-1.5, 4.0)
```

```
([<matplotlib.axis.XTick object at 0x129a454d0>, <matplotlib.axis.XTic
k object at 0x129a3bc50>, <matplotlib.axis.XTick object at 0x129285150
>, <matplotlib.axis.XTick object at 0x129282b90>, <matplotlib.axis.XTi
ck object at 0x1292667d0>], <a list of 5 Text xticklabel objects>)
```

```
([<matplotlib.axis.YTick object at 0x129a45d50>, <matplotlib.axis.YTic
k object at 0x129a3bc10>, <matplotlib.axis.YTick object at 0x12925d790
>, <matplotlib.axis.YTick object at 0x12925dcd0>, <matplotlib.axis.YTi
ck object at 0x12925df10>, <matplotlib.axis.YTick object at 0x129282c1
0>], <a list of 6 Text yticklabel objects>)
```

```
Text(8, 1.5, '$x \\in [0.0, \\ 10.0]$')
```

```
Text(8, 1.8, '$y \\in [-1.0, \\ 4.0]$')
```

```
<matplotlib.collections.PathCollection object at 0x127d38ad0>
```

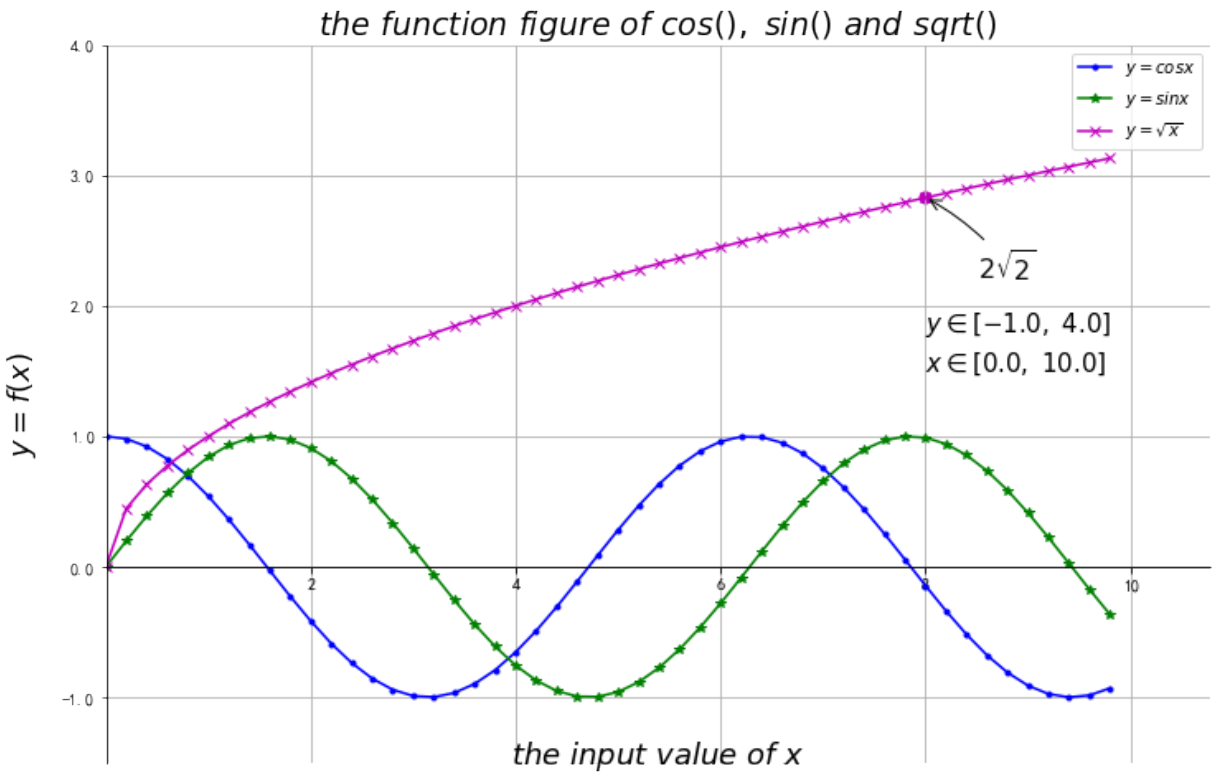
```
Text(8.5, 2.2, '$2\\sqrt{2}$')
```

```
Text(0.5, 1.0, '$the \\ function \\ figure \\ of \\ cos(), \\ sin() \\
 and \\ sqrt()$')
```

```
Text(0.5, 0, '$the \\ input \\ value \\ of \\ x$')
```

```
Text(0, 0.5, '$y = f(x)$')
```

```



<matplotlib.legend.Legend object at 0x12925d8d0>
```



具体细节画法

准备数据

```
x = np.arange(0.,10,0.2) # 生成从0开始,间隔为0.2,到10的数列
x
```

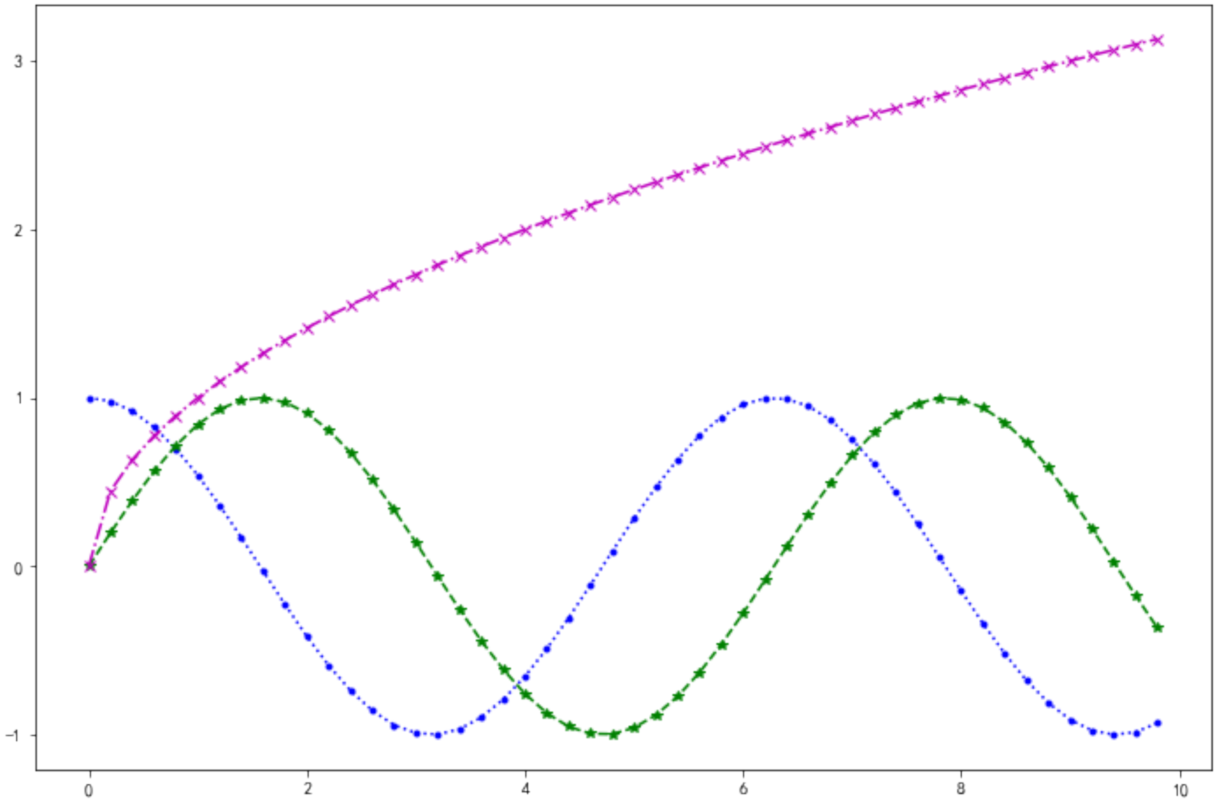
```
array([0. , 0.2, 0.4, 0.6, 0.8, 1. , 1.2, 1.4, 1.6, 1.8, 2. , 2.2, 2.4
,
       2.6, 2.8, 3. , 3.2, 3.4, 3.6, 3.8, 4. , 4.2, 4.4, 4.6, 4.8, 5.
,
       5.2, 5.4, 5.6, 5.8, 6. , 6.2, 6.4, 6.6, 6.8, 7. , 7.2, 7.4, 7.6
,
       7.8, 8. , 8.2, 8.4, 8.6, 8.8, 9. , 9.2, 9.4, 9.6, 9.8])
```

```
y1 = np.cos(x)
y2 = np.sin(x)
y3 = np.sqrt(x)
```

绘制基本曲线

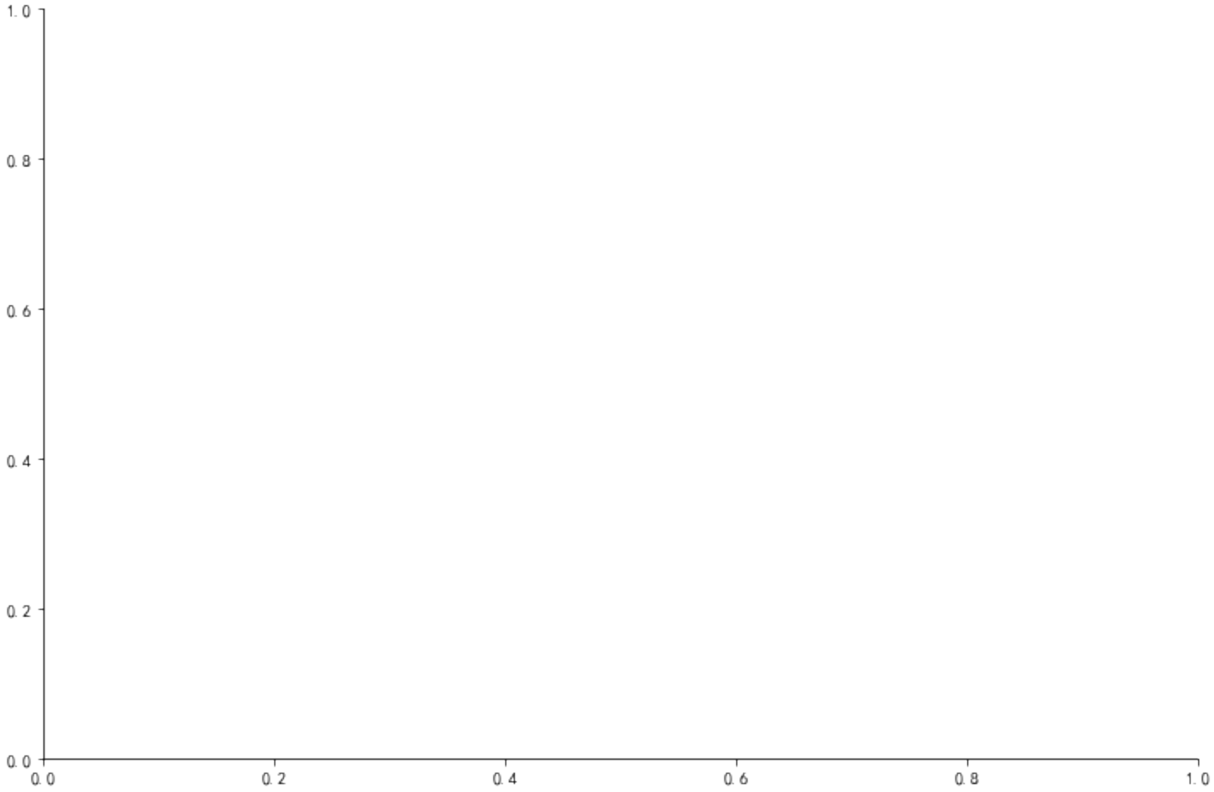
```
plt.rcParams['figure.figsize'] = (12,8) #配置画布
"""
linewidth:宽度,
linestyle:线的形状
marker:每个点的标注
label:标签
"""
plt.plot(x,y1,color='blue',linewidth=1.5,linestyle=':',marker='.',label=r'$y = cos{x}$')
plt.plot(x, y2, color='green', linewidth=1.5, linestyle='--', marker='*', label=r'$y = sin{x}$')
plt.plot(x, y3, color='m', linewidth=1.5, linestyle='-.', marker='x', label=r'$y = \sqrt{x}$')
```

```
'\nlinewidth:宽度,\nlinestyle:线的形状\nmarker:每个点的标注\nlabel:标签\n'





[<matplotlib.lines.Line2D object at 0x12991a9d0>]





[<matplotlib.lines.Line2D object at 0x129920ed0>]





[<matplotlib.lines.Line2D object at 0x1290cef50>]
```



设置坐标轴

```
ax = plt.subplot(111)
ax.spines['right'].set_color('none') #去掉右边边框
ax.spines['top'].set_color('none')       # 去掉上边的边框线
# 移动下边边框线，相当于移动 x 轴
ax.xaxis.set_ticks_position('bottom')
ax.spines['bottom'].set_position(('data', 0))
# 移动左边边框线，相当于移动 y 轴
ax.yaxis.set_ticks_position('left')
ax.spines['left'].set_position(('data', 0))
```



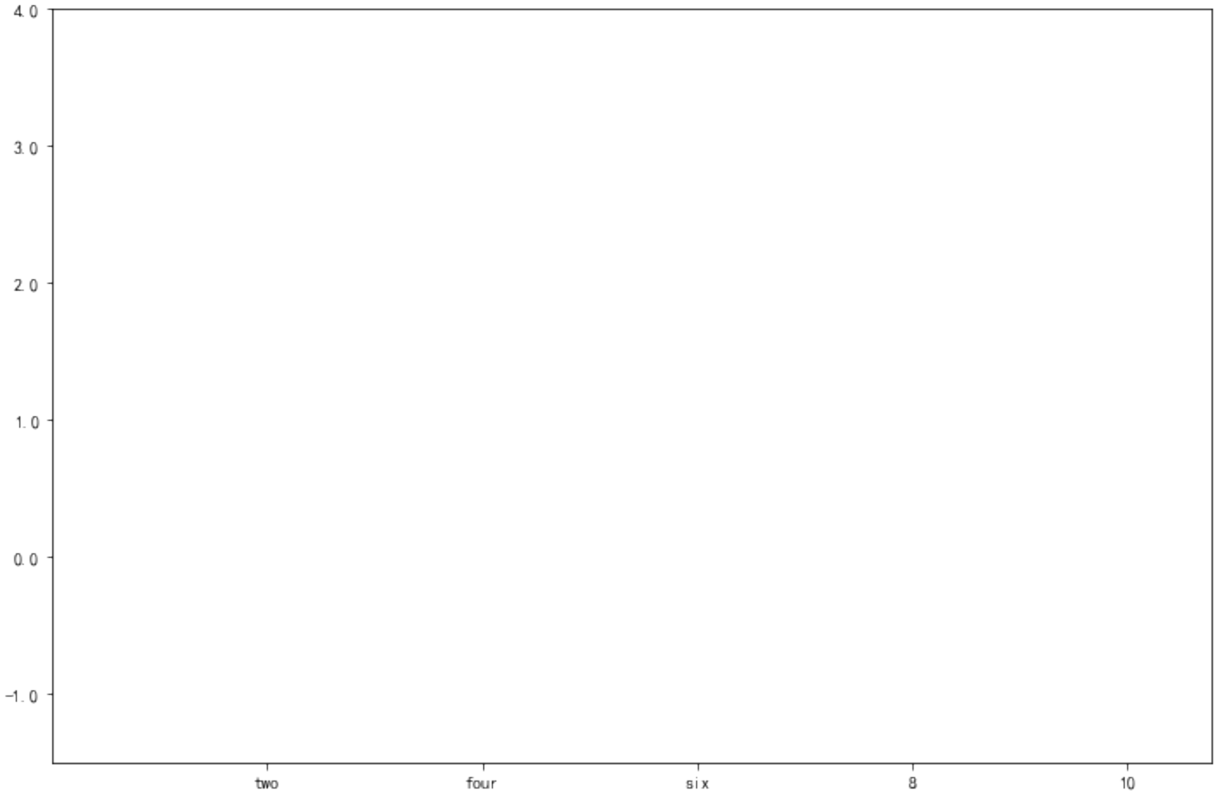
```
#xlim就是设置x轴的刻度取值范围,ylim也一样
plt.xlim(x.min()*1.1,x.max()*1.1)
plt.ylim(-1.5,4.0)

#设置x,y轴的刻度标签值
plt.xticks([2,4,6,8,10],['two','four','six','8','10'])
plt.yticks([-1.0, 0.0, 1.0, 2.0, 3.0, 4.0],[r'-1.0', r'0.0', r'1.0', r
'2.0', r'3.0', r'4.0'])
```

```
(0.0, 10.780000000000001)
```

```
(-1.5, 4.0)
```

```
([<matplotlib.axis.XTick object at 0x1298ec050>, <matplotlib.axis.XTic
k object at 0x1298e07d0>, <matplotlib.axis.XTick object at 0x1298e0950
>, <matplotlib.axis.XTick object at 0x12916f390>, <matplotlib.axis.XTi
ck object at 0x12916f9d0>], <a list of 5 Text xticklabel objects>)
```

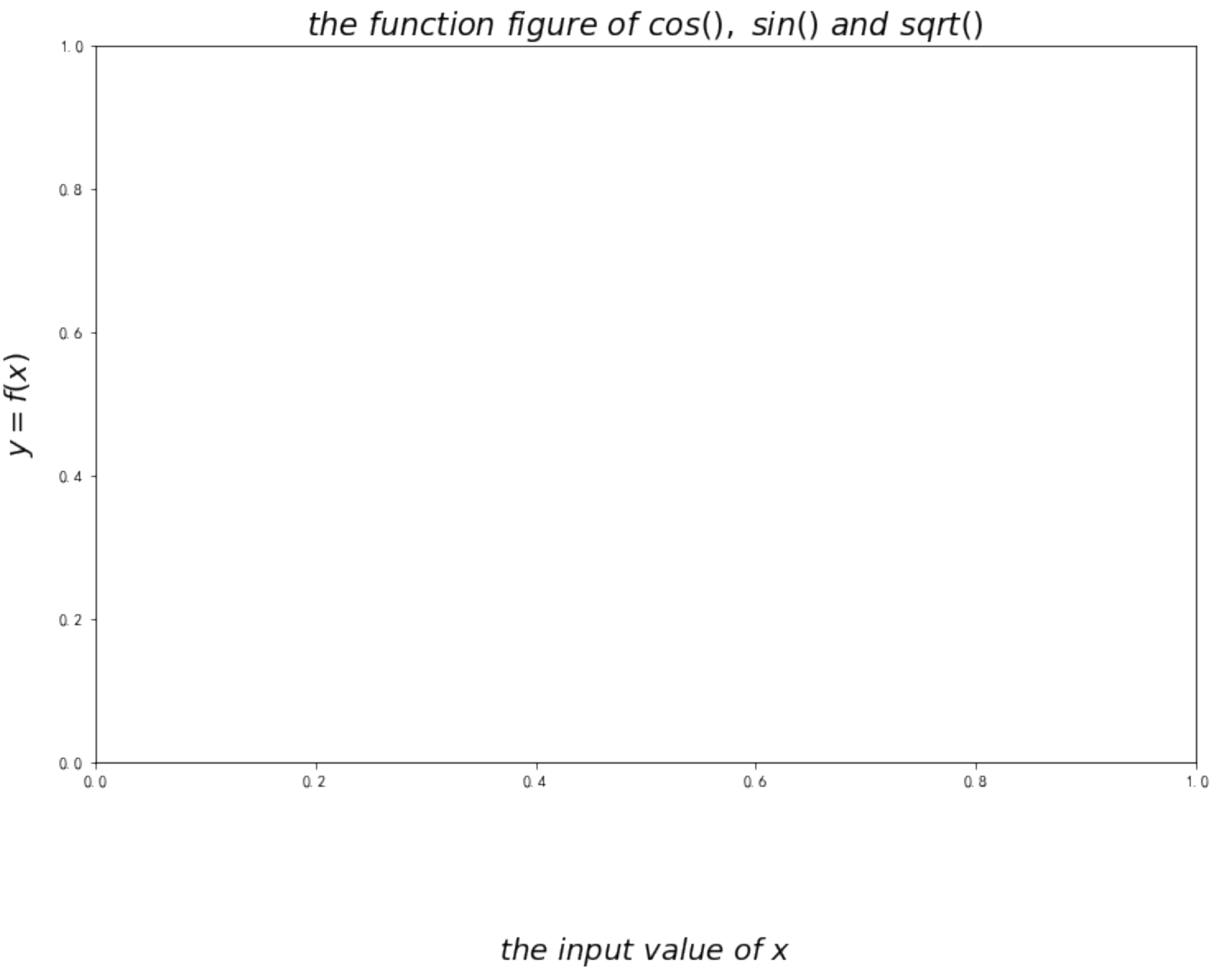
```
([<matplotlib.axis.YTick object at 0x1298dd110>, <matplotlib.axis.YTic
k object at 0x1290d5590>, <matplotlib.axis.YTick object at 0x1298e0910
>, <matplotlib.axis.YTick object at 0x129170610>, <matplotlib.axis.YTi
ck object at 0x12916f610>, <matplotlib.axis.YTick object at 0x12917071
0>], <a list of 6 Text yticklabel objects>)
```



设置标题,x轴,y轴

```
plt.title(r'$the \ function \ figure \ of \ cos(), \ sin() \ and \ sqrt()$', fontsize=19)
plt.xlabel(r'$the \ input \ value \ of \ x$', fontsize=18, labelpad=88.8)
plt.ylabel(r'$y = f(x)$', fontsize=18, labelpad=12.5)
```

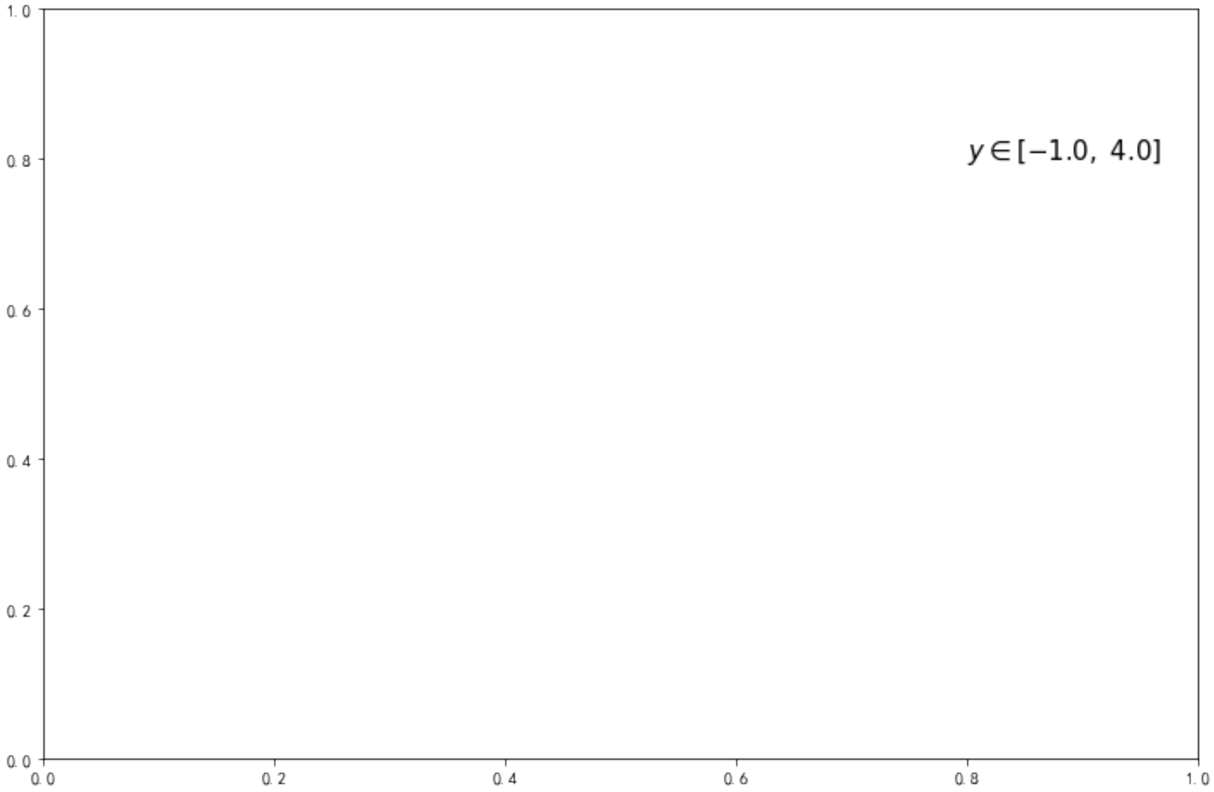
```
Text(0.5, 1.0, '$the \\ function \\ figure \\ of \\ cos(), \\ sin() \\ and \\ sqrt()$')







Text(0.5, 0, '$the \\ input \\ value \\ of \\ x$')







Text(0, 0.5, '$y = f(x)$')
```



设置文字描述,注解

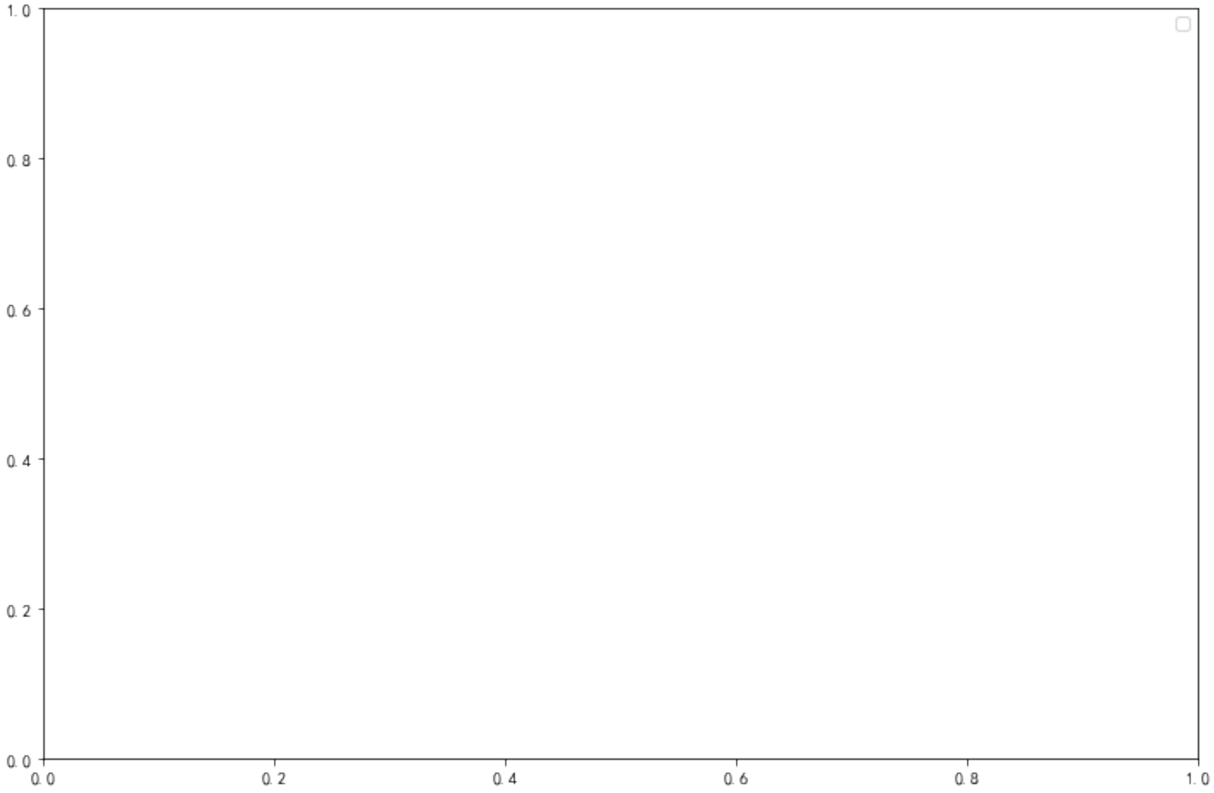
```
plt.text(0.8, 0.8, r'$y \in [-1.0, \ 4.0]$', color='k', fontsize=15)
```

```
Text(0.8, 0.8, '$y \\in [-1.0, \\ 4.0]$')
```



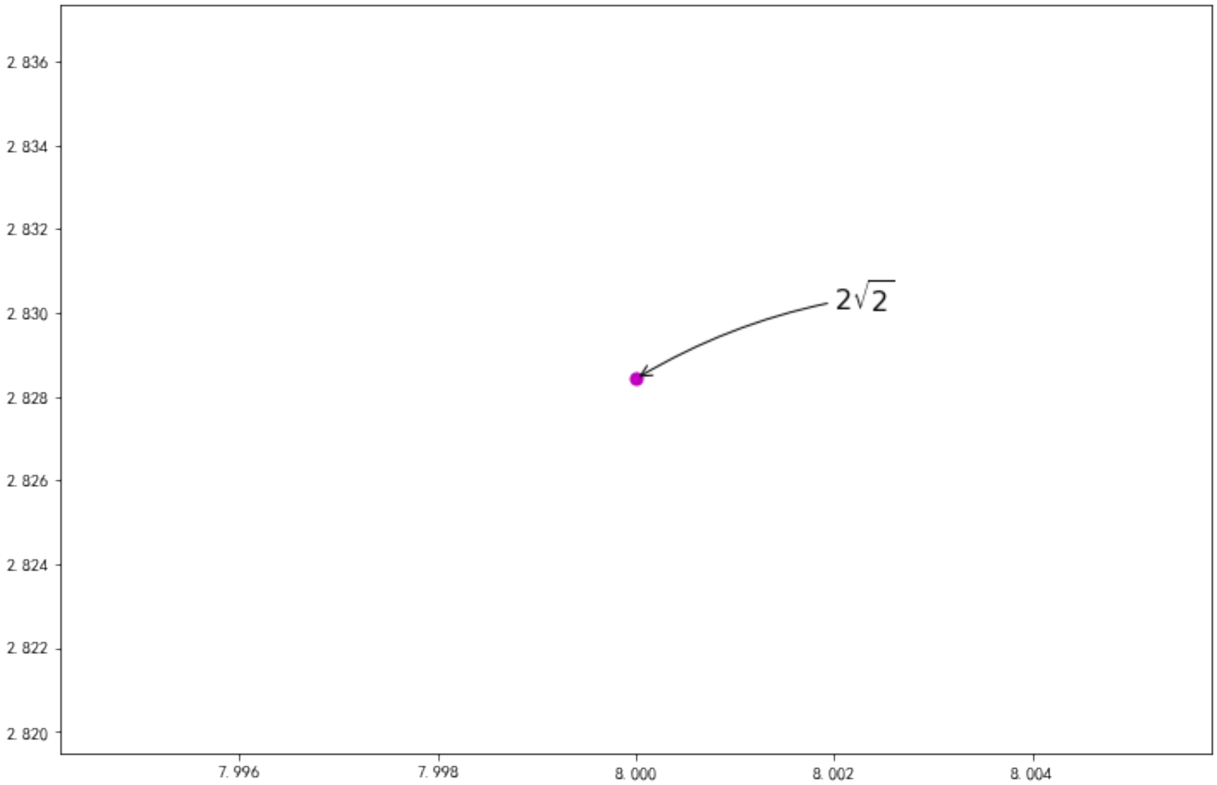
```
plt.legend(['cos(x)', 'sin(x)', 'sqrt(x)'], loc='upper right')
```

```
<matplotlib.legend.Legend object at 0x129955a50>
```



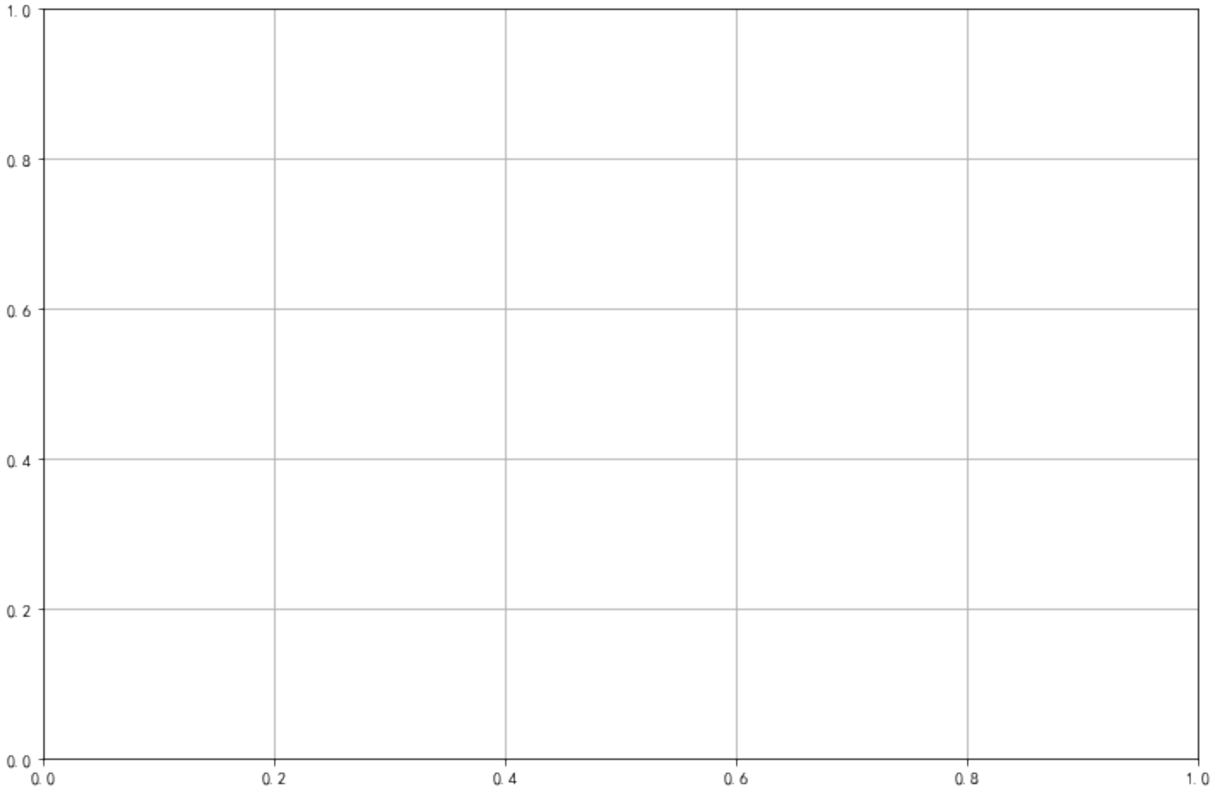
```
# 特殊点添加注解
plt.scatter([8,],[np.sqrt(8),], 50, color ='m')  # 使用散点图放大当前点
plt.annotate(r'$2\sqrt{2}$', xy=(8, np.sqrt(8)), xytext=(8.002, 2.83), fontsize=16, color='#090909', arrowprops=dict(arrowstyle='->', connectionstyle='arc3, rad=0.1', color='#090909'))
```

```
<matplotlib.collections.PathCollection object at 0x129198690>




Text(8.002, 2.83, '$2\\sqrt{2}$')
```



显示网格

```
plt.grid(True)
```



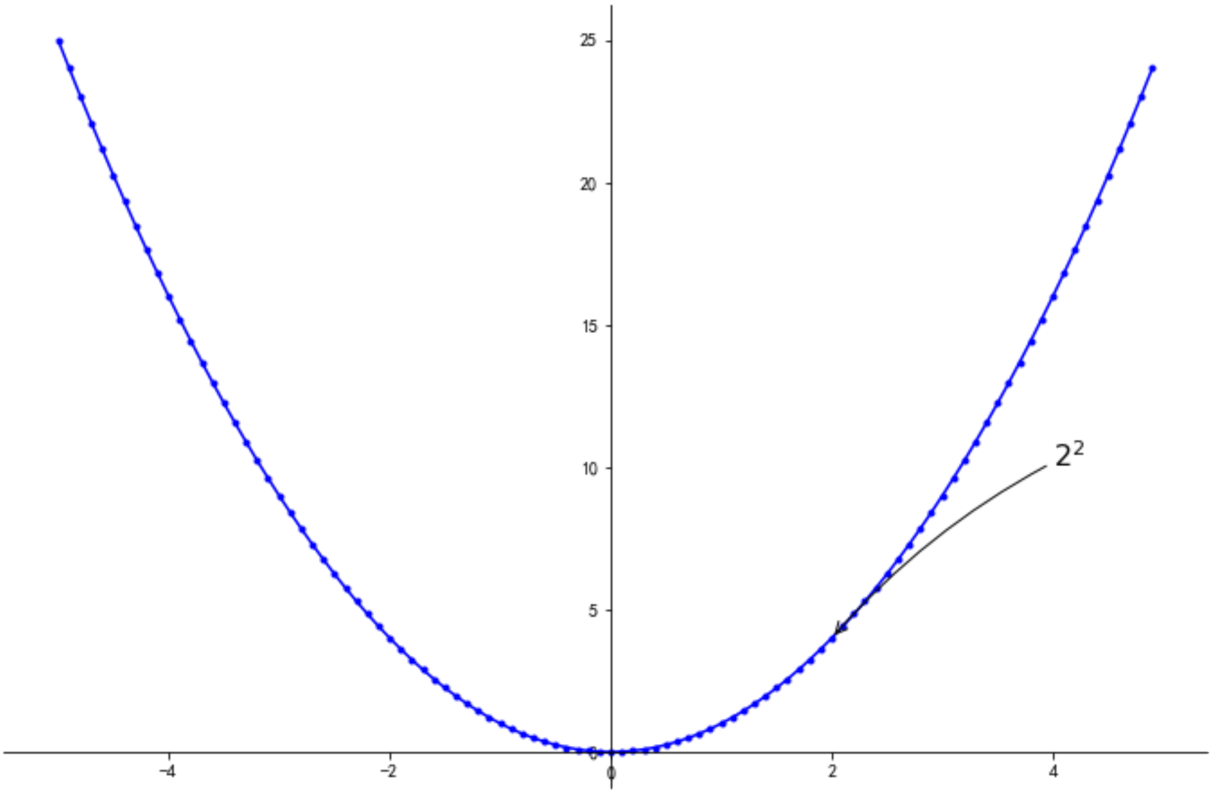
其他常用图形

```
# 和dataframe自带的matplot差不多
```

曲线图

```
x = np.arange(-5,5,0.1)
y = x ** 2
plt.plot(x,y, color='blue', linewidth=1.5, linestyle='-', marker='.',
label=r'$y = x**2 $')
# 坐标轴上移
ax = plt.subplot(111)
ax.spines['right'].set_color('none')     # 去掉右边的边框线
ax.spines['top'].set_color('none')       # 去掉上边的边框线

# 移动下边边框线，相当于移动 x 轴
ax.xaxis.set_ticks_position('bottom')
ax.spines['bottom'].set_position(('data', 0))

# 移动左边边框线，相当于移动 y 轴
ax.yaxis.set_ticks_position('left')
ax.spines['left'].set_position(('data', 0))

plt.annotate(r'$2^2$', xy=(2, np.power(2,2)), xytext=(4, 10), fontsize
=16, color='#090909', arrowprops=dict(arrowstyle='->', connectionstyle
='arc3, rad=0.1', color='#090909'))
plt.show()
```

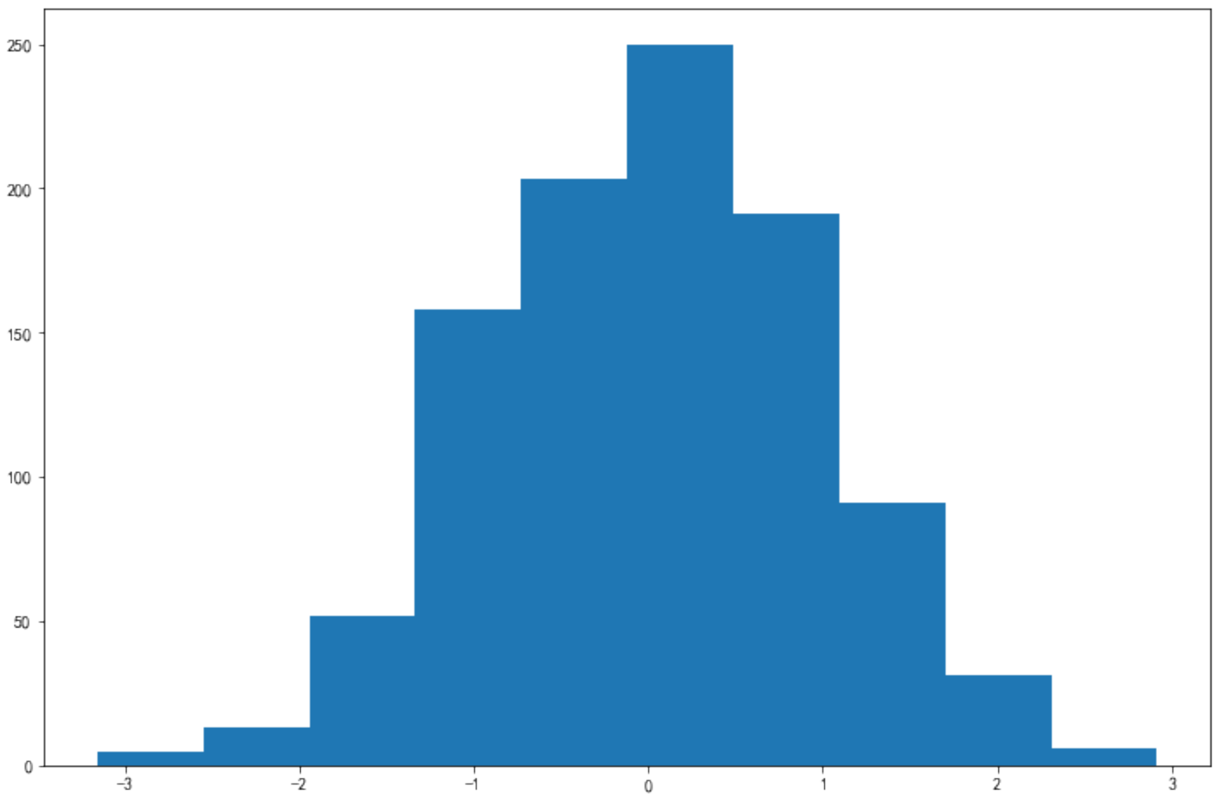
```
[<matplotlib.lines.Line2D object at 0x12d0bb910>]



/Users/flybird/opt/anaconda3/lib/python3.7/site-packages/ipykernel_lau
ncher.py:5: MatplotlibDeprecationWarning: Adding an axes using the sam
e arguments as a previous axes currently reuses the earlier instance.
 In a future version, a new instance will always be created and return
ed.  Meanwhile, this warning can be suppressed, and the future behavio
r ensured, by passing a unique label to each axes instance.
  """






Text(4, 10, '$2^2$')
```



直方图

```
x = np.random.normal(size=1000)
plt.hist(x, bins=10)
```

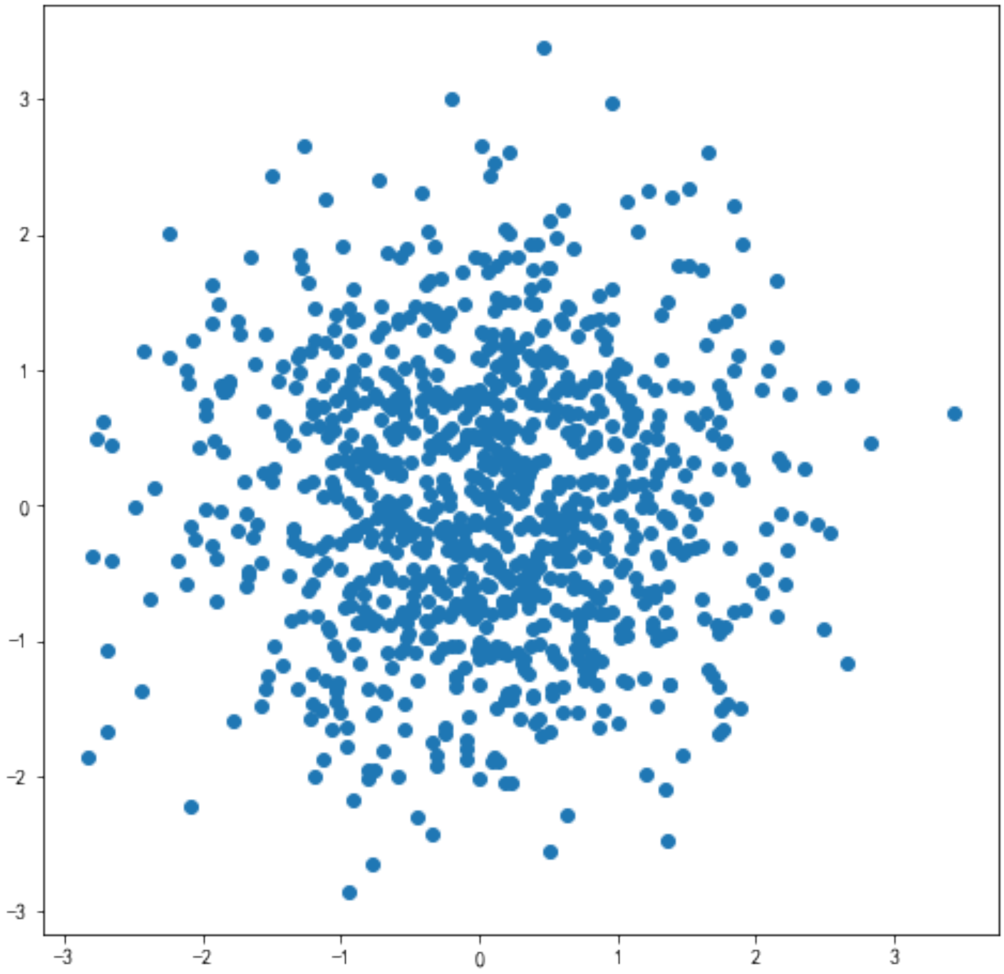
```
(array([  5.,  13.,  52., 158., 203., 250., 191.,  91.,  31.,   6.]),
array([-3.15751873, -2.5500038 , -1.94248886, -1.33497393, -0.727459
,
       -0.11994407,  0.48757086,  1.0950858 ,  1.70260073,  2.31011566
,
        2.91763059]), <a list of 10 Patch objects>)
```



散点图

```
plt.rcParams["figure.figsize"] = (8,8)
x = np.random.normal(size=1000)
y = np.random.normal(size=1000)
plt.scatter(x,y)
```

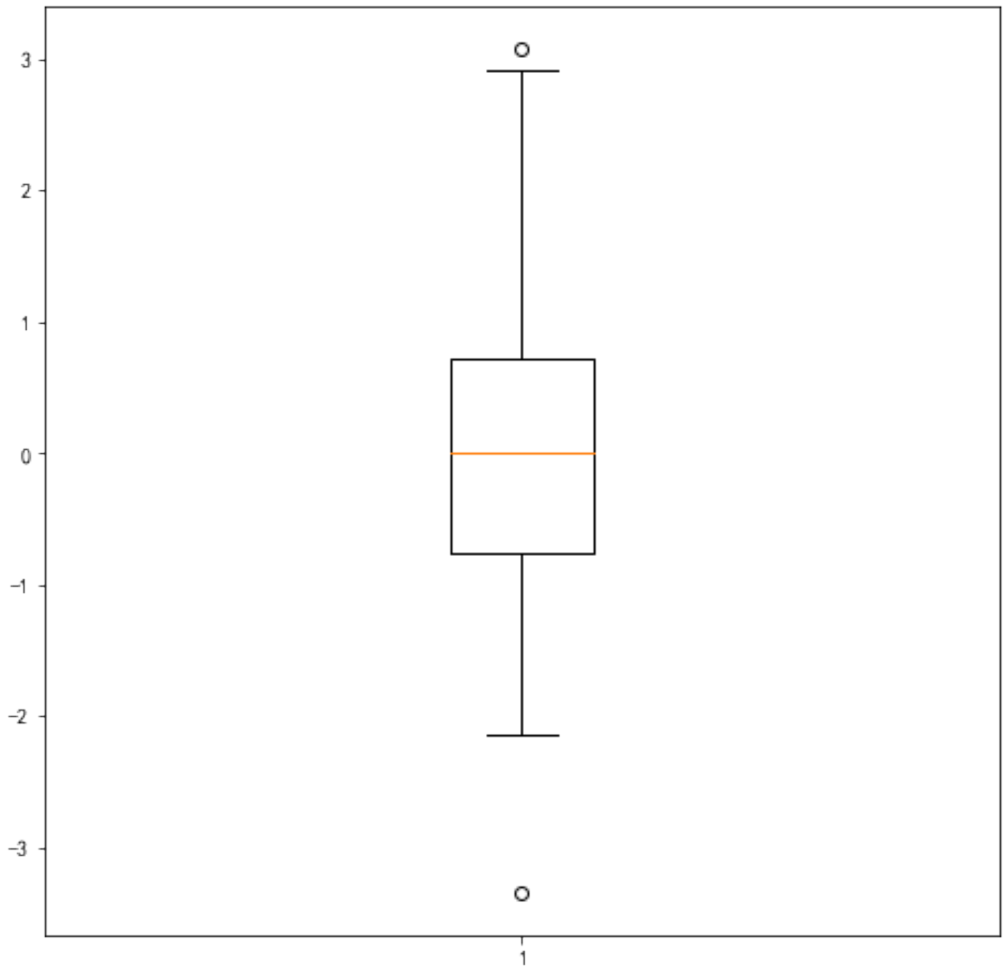
```
<matplotlib.collections.PathCollection object at 0x12d450190>
```



箱式图

```
plt.rcParams["figure.figsize"] = (8,8)
x = np.random.normal(size=100)
plt.boxplot(x)
```

```
{'whiskers': [<matplotlib.lines.Line2D object at 0x12d5b2910>, <matplo
tlib.lines.Line2D object at 0x12d6d6a50>], 'caps': [<matplotlib.lines.
Line2D object at 0x12d6d6f10>, <matplotlib.lines.Line2D object at 0x12
d6becd0>], 'boxes': [<matplotlib.lines.Line2D object at 0x12d5bd390>],
 'medians': [<matplotlib.lines.Line2D object at 0x12d438a10>], 'fliers
': [<matplotlib.lines.Line2D object at 0x12d6dccd0>], 'means': []}
```


3
2
1
0
−1
−2
−3
1