KyotoUx-009x (/github/ryo0921/KyotoUx-009x/tree/master)
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Stochastic Processes:
Data Analysis and Computer Simulation

Python programming for beginners

2. Making graphs with matplotlib

2.1. Import libraries

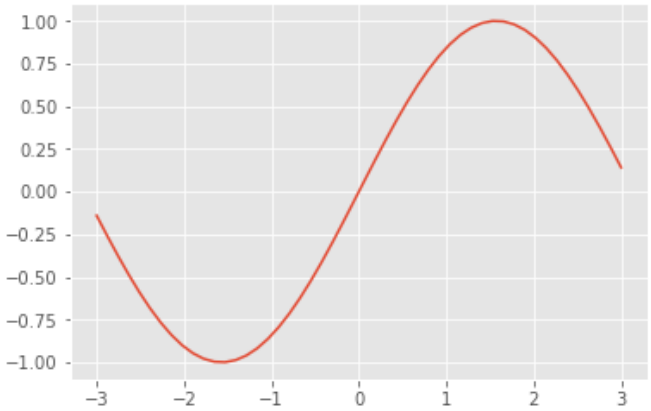
A code example

In [1]:
```
% matplotlib inline
import numpy as np # import numpy library as np
import matplotlib.pyplot as plt # import pyplot library as plt
plt.style.use('ggplot') # use "ggplot" style for graphs
```

2.2. plot $\sin(x)$

A code example

In [2]:
```
x = np.linspace(-3, 3) # create array of x from -3 to 3
y = np.sin(x)  # create array of sin(x)
plt.plot(x, y) # plot y vs. x
plt.show()     # display plot
```



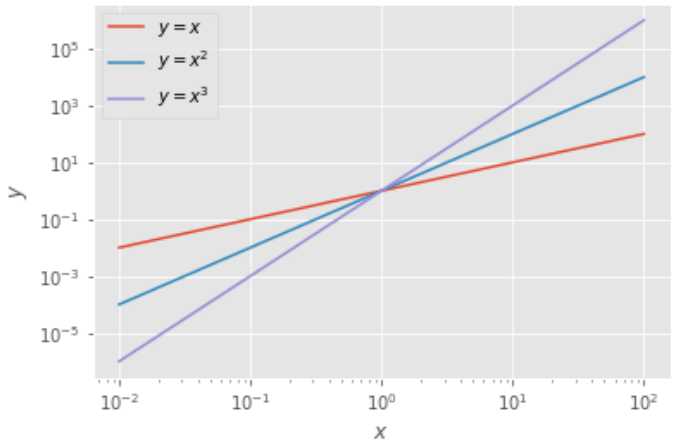
2.3. plot x, x^2, x^3, ⋯ in log-log scale.

A code example

In [3]:
```
def func (x,n):
    y = x**n
    return y
```

A code example

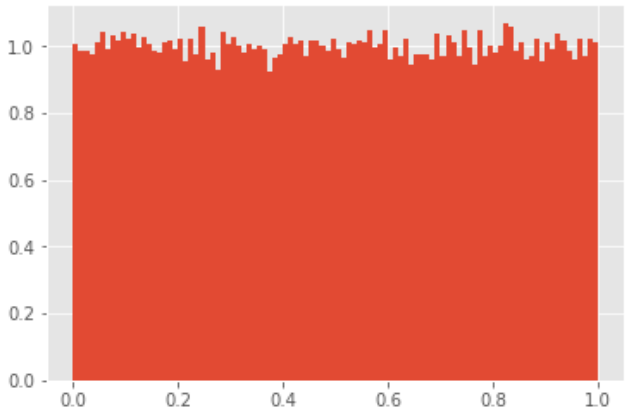
In [4]:
```
x = np.logspace(-2,2) # create array of x from
# 10^-2 to 10^2 equally spaced in log scale
plt.plot(x,func(x,1),label='$y=x$')   # plot y=x
plt.plot(x,func(x,2),label='$y=x^2$') # plot y=x^2
plt.plot(x,func(x,3),label='$y=x^3$') # plot y=x^3
plt.legend()     # display plot legends
plt.xscale("log") # set log scale for x axis
plt.yscale("log") # set log scale for y axis
plt.xlabel("$x$") # display name of x axis
plt.ylabel("$y$") # display name of y axis
plt.show()        # display plots
```



2.4. Make histgram plot

A code example

In [5]:
```
N = 100000 # size of R
np.random.seed(0) # initialization of the random number generator
R = np.random.rand(N) # generate random sequence and store it as R
# plot normalized histgram of R using 100 bins
plt.hist(R,bins=100,normed=True)
plt.show() # show plot
```



2.5. Trajectory plot, position(step)

A code example

In [6]:
```
NSTEP = 10000 # number of random steps
plt.xlabel("number of steps") # name of x axis
plt.ylabel("position") # name of y axis
for nseed in range(10):# generate 10 random walks
    # initialize random step generator with different nseeds
    np.random.seed(nseed)
    # generate random sequencies of NSTEP +1/-1 steps
    step = np.random.choice([-1,1],NSTEP)
    # calculate position of random walk at each step
    position = np.cumsum(step)
    plt.plot(position) # plot position(step) vs. step
```

References

- `matplotlib` website, http://matplotlib.org/ (http://matplotlib.org/)
- `matplotlib` gallery page, http://matplotlib.org/gallery.html (http://matplotlib.org/gallery.html)
- Python website, https://www.python.org/ (https://www.python.org/)