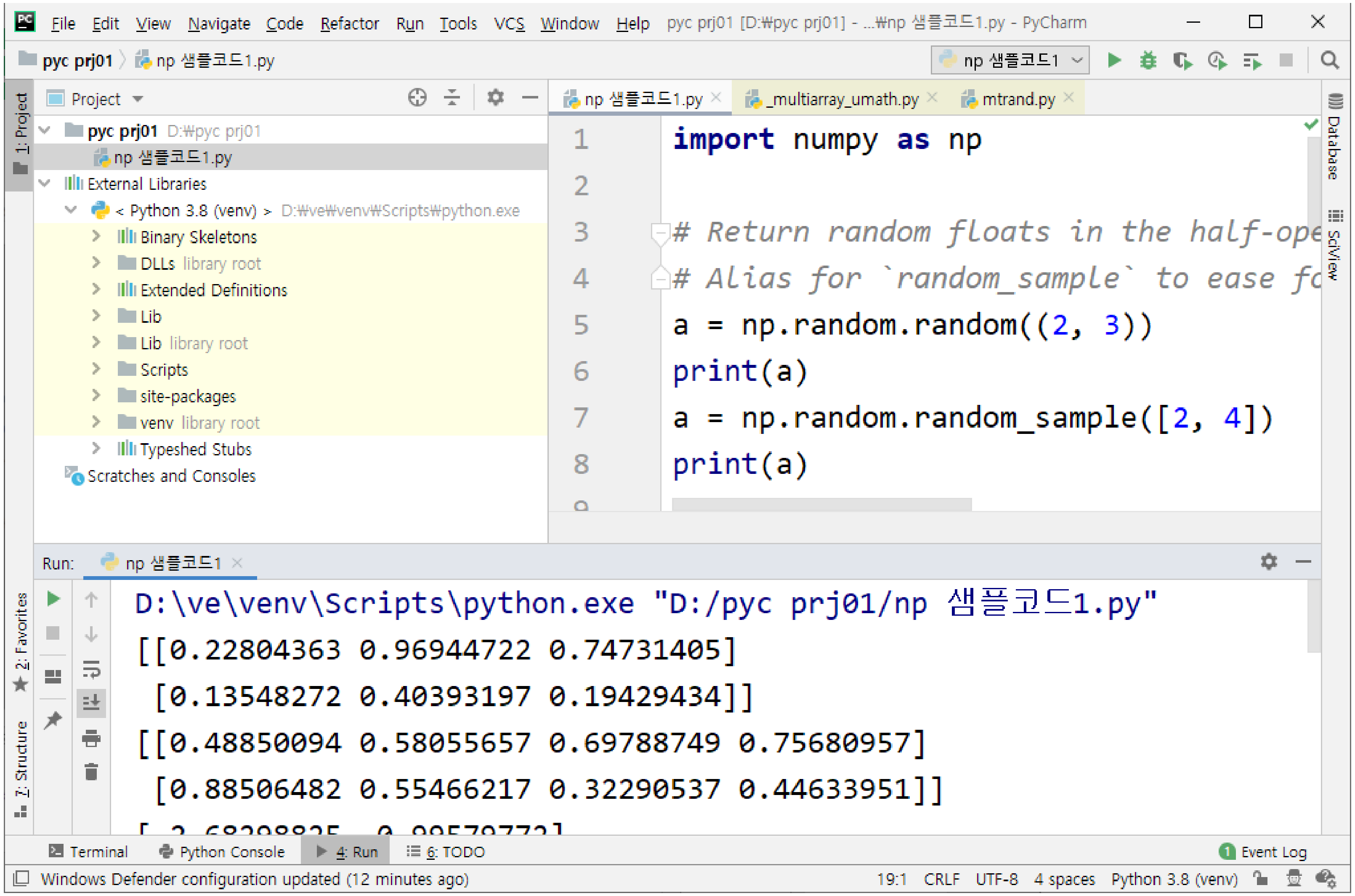
파이참 프로젝트에서 데이터 과학을 위한 준비 numpy

numpy npsample1.py



```python
import numpy as np

# Return random floats in the half-ope
# Alias for `random_sample` to ease fo
a = np.random.random((2, 3))
print(a)
a = np.random.random_sample([2, 4])
print(a)
```

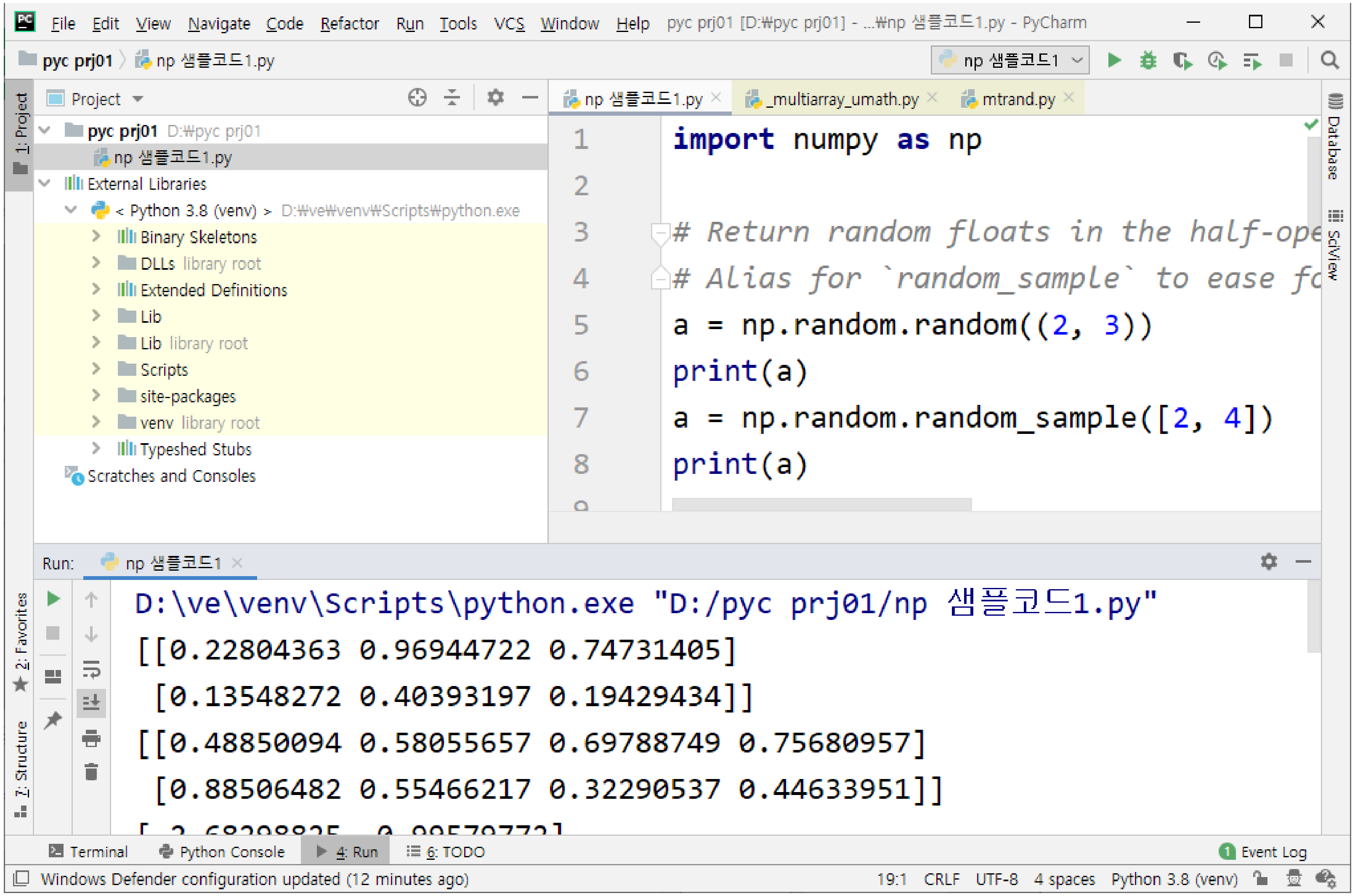
```
D:\ve\venv\Scripts\python.exe "D:/pyc prj01/np 샘플코드1.py"
[[0.22804363 0.96944722 0.74731405]
 [0.13548272 0.40393197 0.19429434]]
[[0.48850094 0.58055657 0.69788749 0.75680957]
 [0.88506482 0.55466217 0.32290537 0.44633951]]
```

numpy npsample1.py 이해

```python
import numpy as np

# Return random floats in the half-open interval
[0.0, 1.0).
# Alias for `random_sample` to ease forward-
porting to the new random API.
a = np.random.random((2, 3))
print(a)
a = np.random.random_sample([2, 4])
print(a)

# 정규분포의 난수 생성
b = np.random.randn(2)
print(b)
b = np.random.randn(2, 3)
print(b)
b = np.random.randn(3, 4)
print(b)

# 값이 모두 1인 텐서
c = np.ones(3)
print(c)

# 값이 모두 0인 텐서
c = np.zeros((2, 3))
print(c)
c = np.zeros([3, 4])
print(c)
```

```
D:₩ve₩venv₩Scripts₩python.exe "D:/pyc prj01/np 샘플코드1.py"
[[0.22804363 0.96944722 0.74731405]
 [0.13548272 0.40393197 0.19429434]]
[[0.48850094 0.58055657 0.69788749 0.75680957]
 [0.88506482 0.55466217 0.32290537 0.44633951]]
[-2.68298825 -0.99579772]
[[-0.16099173  1.29978199  1.66469465]
 [ 0.68463138 -1.58433849 -0.06550564]]
[[ 0.02758157 -0.77454657  0.49862683  0.70299809]
 [ 1.57338867 -0.71034582  0.06683078 -1.51798292]
 [-0.20716991 -0.45346911  0.20735756 -0.76737582]]
[1. 1. 1.]
[[0. 0. 0.]
 [0. 0. 0.]]
[[0. 0. 0. 0.]
 [0. 0. 0. 0.]
 [0. 0. 0. 0.]]

Process finished with exit code 0
```

numpy npsample2.py



```python
import numpy as np

# Return random floats in the half-ope
# Alias for `random_sample` to ease fo
a = np.random.random((2, 3))
print(a)
a = np.random.random_sample([2, 4])
print(a)
```

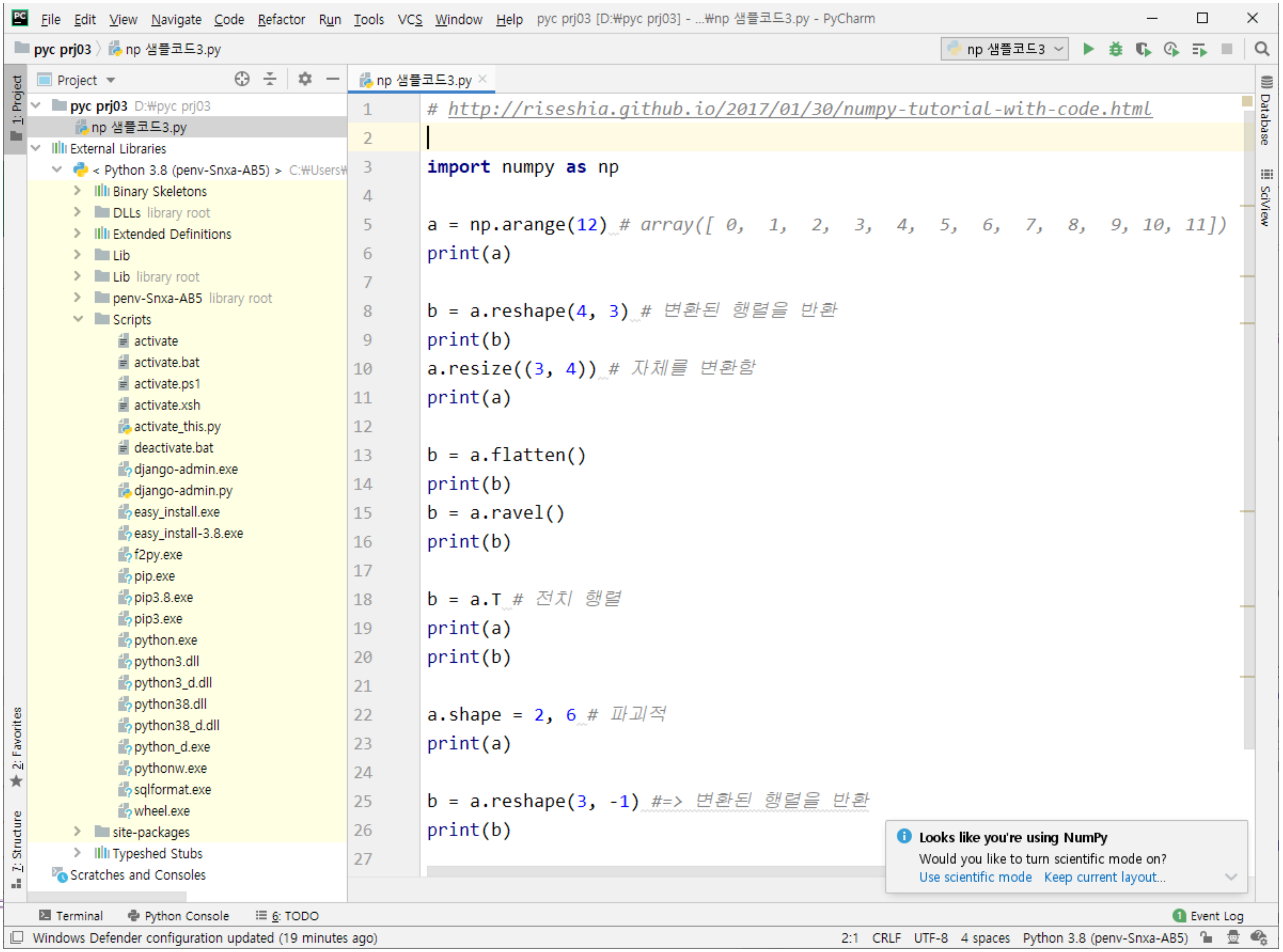
```
D:\ve\venv\Scripts\python.exe "D:/pyc prj01/np 샘플코드1.py"
[[0.22804363 0.96944722 0.74731405]
 [0.13548272 0.40393197 0.19429434]]
[[0.48850094 0.58055657 0.69788749 0.75680957]
 [0.88506482 0.55466217 0.32290537 0.44633951]]
```

numpy npsample2.py 이해

```python
import numpy as np

# [0, 1) 난수 생성
a = np.random.random((2, 3))
print(type(a))
print(a)
b = a.reshape(3, 2)
print(b)

# 정규분포의 난수 생성
c = np.random.randn(3, 4)
print(c.reshape(2, 6))

# 값이 모두 1인 텐서
d = np.ones((4, 5))
print(d.reshape(2, 5, 2))

# 값이 모두 0인 텐서
e = np.zeros((3, 4))
print(e.reshape(2, 3, 2))
```

```
D:₩ve₩venv_test₩Scripts₩python.exe "D:/pyc prj02/np 샘플코드2.py"
<class 'numpy.ndarray'>
[[0.82253794 0.94805217 0.18727646]
 [0.93734334 0.64931534 0.34043917]]
[[0.82253794 0.94805217]
 [0.18727646 0.93734334]
 [0.64931534 0.34043917]]
[[ 0.75831872  0.48717349  0.28570681 -1.52723675 -0.44313711 -0.95670083]
 [-0.12955399  0.60647143  0.33132981  0.63755303  1.12009118  0.09013185]]
[[[1. 1.]
  [1. 1.]
  [1. 1.]
  [1. 1.]
  [1. 1.]]

 [[1. 1.]
  [1. 1.]
  [1. 1.]
  [1. 1.]
  [1. 1.]]]
[[[0. 0.]
  [0. 0.]
  [0. 0.]]

 [[0. 0.]
  [0. 0.]
  [0. 0.]]]

Process finished with exit code 0
```

numpy npsample3.py



```python
# http://riseshia.github.io/2017/01/30/numpy-tutorial-with-code.html

import numpy as np

a = np.arange(12) # array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11])
print(a)

b = a.reshape(4, 3) # 변환된 행렬을 반환
print(b)
a.resize((3, 4)) # 자체를 변환함
print(a)

b = a.flatten()
print(b)
b = a.ravel()
print(b)

b = a.T # 전치 행렬
print(a)
print(b)

a.shape = 2, 6 # 파괴적
print(a)

b = a.reshape(3, -1) #=> 변환된 행렬을 반환
print(b)
```

Looks like you're using NumPy
Would you like to turn scientific mode on?
Use scientific mode Keep current layout...

Windows Defender configuration updated (19 minutes ago)

numpy npsample3.py 이해

```python
# http://riseshia.github.io/2017/01/30/numpy-tutorial-with-code.html

import numpy as np

a = np.arange(12) # array([ 0, … 11])
print(a)

b = a.reshape(4, 3) # 변환된 행렬을 반환
print(b)
a.resize((3, 4)) # 자체를 변환함
print(a)

b = a.flatten()
print(b)
b = a.ravel()
print(b)

b = a.T # 전치 행렬
print(a)
print(b)

a.shape = 2, 6 # 파괴적
print(a)

b = a.reshape(3, -1) # 변환된 행렬을 반환
print(b)
```

```
C:₩Users₩217₩.virtualenvs₩penv-Snxa-
AB5₩Scripts₩python.exe "D:/pyc prj03/np 샘플코드3.py"
[ 0  1  2  3  4  5  6  7  8  9 10 11]
[[ 0  1  2]
 [ 3  4  5]
 [ 6  7  8]
 [ 9 10 11]]
[[ 0  1  2  3]
 [ 4  5  6  7]
 [ 8  9 10 11]]
[ 0  1  2  3  4  5  6  7  8  9 10 11]
[ 0  1  2  3  4  5  6  7  8  9 10 11]
[[ 0  1  2  3]
 [ 4  5  6  7]
 [ 8  9 10 11]]
[[ 0  4  8]
 [ 1  5  9]
 [ 2  6 10]
 [ 3  7 11]]
[[ 0  1  2  3  4  5]
 [ 6  7  8  9 10 11]]
[[ 0  1  2  3]
 [ 4  5  6  7]
 [ 8  9 10 11]]

Process finished with exit code 0
```

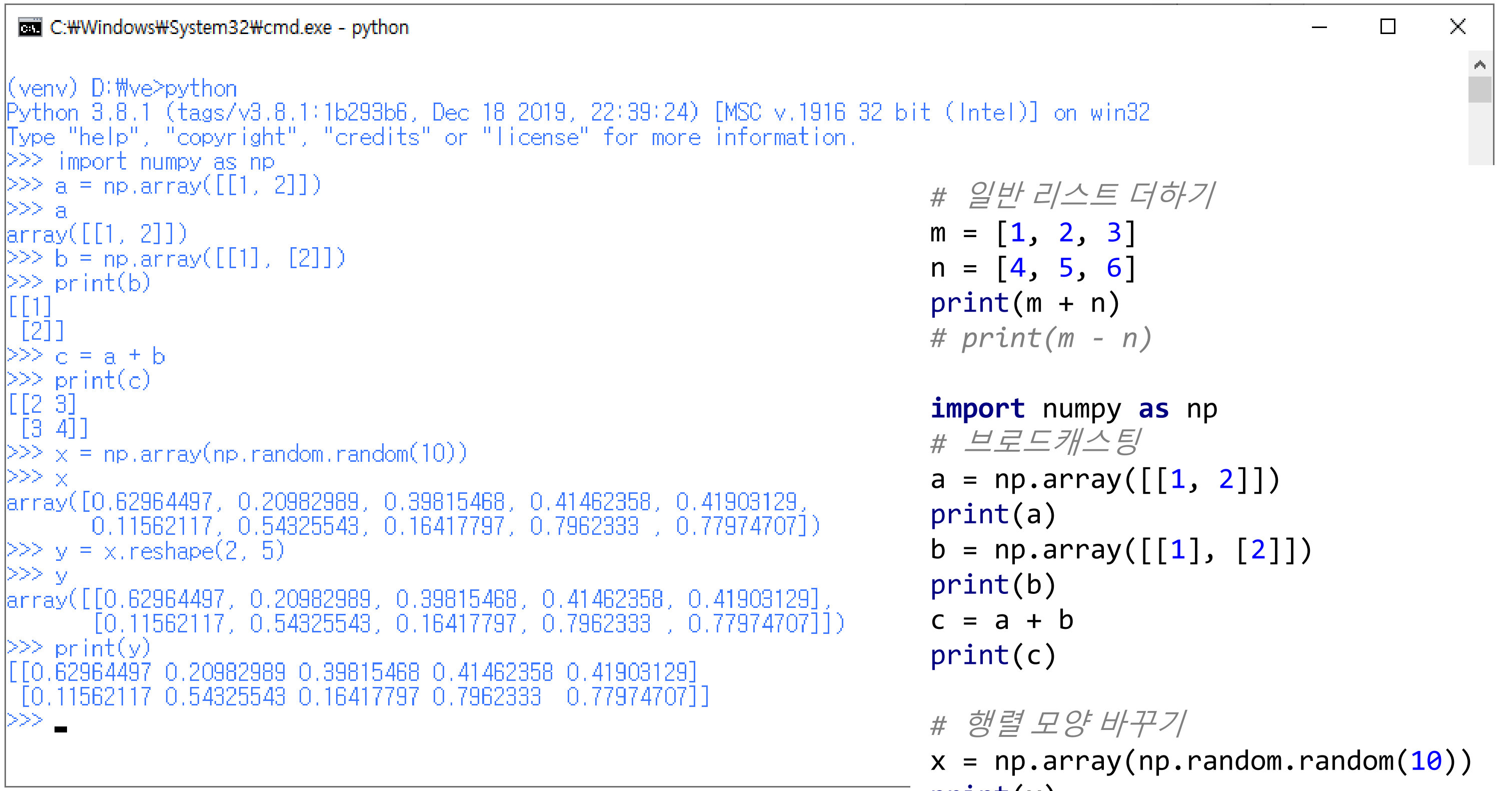
Numpy npsample4.py 이해

```python
import numpy as np

a = np.array(3)
print(type(a))
print(a.ndim, a.shape)
print(a)

b = np.array([1, 2, 3])
print(type(b))
print(b.ndim, b.shape)
print(b)

c = np.array([[1, 2], [3, 4]])
print(type(c))
print(c.ndim, c.shape)
print(c)

d = np.arange(10)
print(type(c))
print(d.ndim, d.shape)
print(d)

e = range(10)
print(type(e))
print(e)
print(list(e))
```

```
<class 'numpy.ndarray'>
0 ()
3
<class 'numpy.ndarray'>
1 (3,)
[1 2 3]
<class 'numpy.ndarray'>
2 (2, 2)
[[1 2]
 [3 4]]
<class 'numpy.ndarray'>
1 (10,)
[0 1 2 3 4 5 6 7 8 9]
<class 'range'>
range(0, 10)
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
```

Numpy npsample5.py 이해

- numpy 테스트
  - 브로드캐스팅과 행렬 모양 변환



C:\Windows\System32\cmd.exe - python

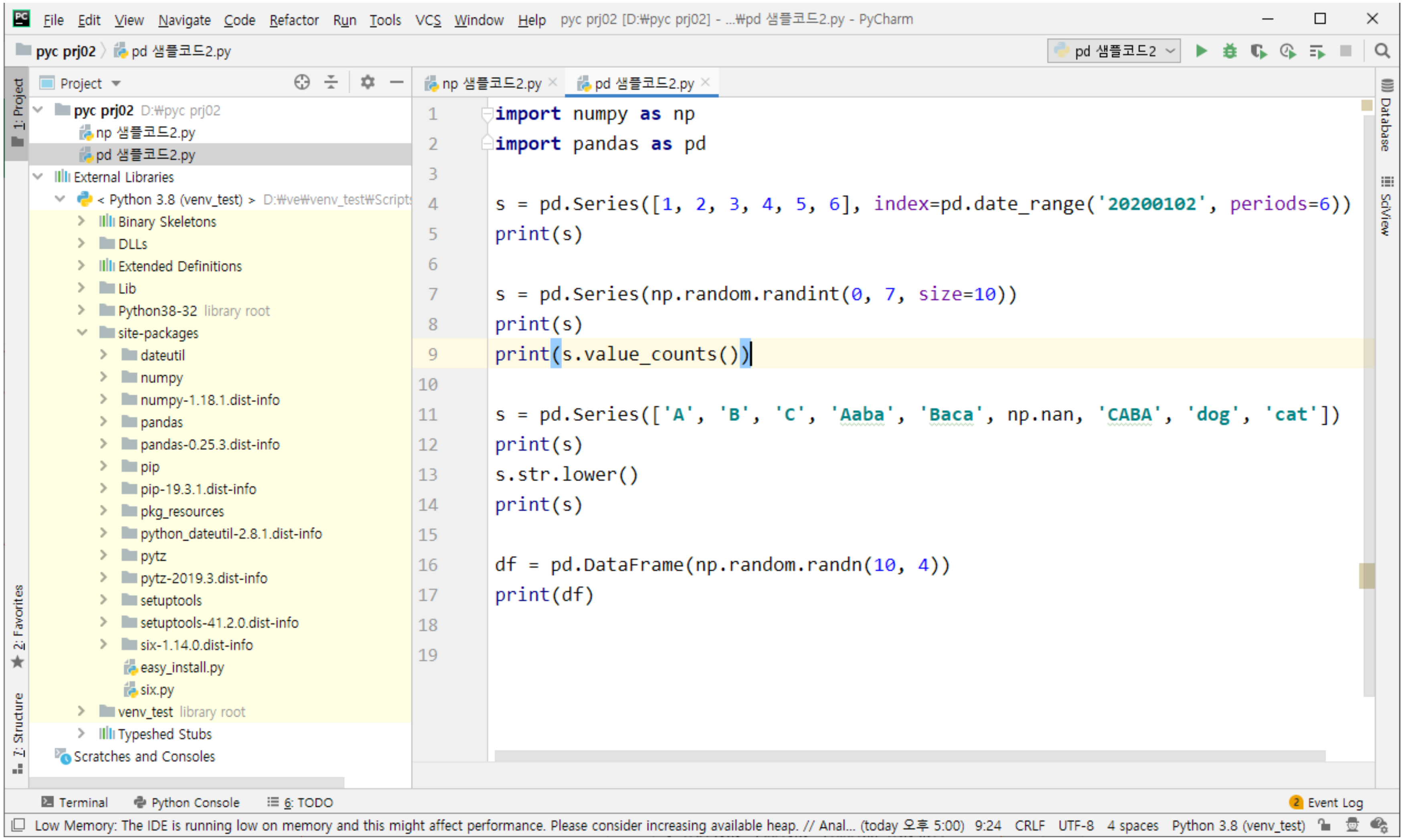
```
(venv) D:\ve>python
Python 3.8.1 (tags/v3.8.1:1b293b6, Dec 18 2019, 22:39:24) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> import numpy as np
>>> a = np.array([[1, 2]])
>>> a
array([[1, 2]])
>>> b = np.array([[1], [2]])
>>> print(b)
[[1]
 [2]]
>>> c = a + b
>>> print(c)
[[2 3]
 [3 4]]
>>> x = np.array(np.random.random(10))
>>> x
array([0.62964497, 0.20982989, 0.39815468, 0.41462358, 0.41903129,
       0.11562117, 0.54325543, 0.16417797, 0.7962333 , 0.77974707])
>>> y = x.reshape(2, 5)
>>> y
array([[0.62964497, 0.20982989, 0.39815468, 0.41462358, 0.41903129],
       [0.11562117, 0.54325543, 0.16417797, 0.7962333 , 0.77974707]])
>>> print(y)
[[0.62964497 0.20982989 0.39815468 0.41462358 0.41903129]
 [0.11562117 0.54325543 0.16417797 0.7962333  0.77974707]]
>>> _
```

```python
# 일반 리스트 더하기
m = [1, 2, 3]
n = [4, 5, 6]
print(m + n)
# print(m - n)

import numpy as np
# 브로드캐스팅
a = np.array([[1, 2]])
print(a)
b = np.array([[1], [2]])
print(b)
c = a + b
print(c)

# 행렬 모양 바꾸기
x = np.array(np.random.random(10))
print(x)
y = x.reshape(2, 5)
print(y)
```

파이참 프로젝트에서 데이터 과학을 위한 준비

pandas

Pandas, pdsample1.py



```python
import numpy as np
import pandas as pd

s = pd.Series([1, 2, 3, 4, 5, 6], index=pd.date_range('20200102', periods=6))
print(s)

s = pd.Series(np.random.randint(0, 7, size=10))
print(s)
print(s.value_counts())

s = pd.Series(['A', 'B', 'C', 'Aaba', 'Baca', np.nan, 'CABA', 'dog', 'cat'])
print(s)
s.str.lower()
print(s)

df = pd.DataFrame(np.random.randn(10, 4))
print(df)
```

Low Memory: The IDE is running low on memory and this might affect performance. Please consider increasing available heap. // Anal... (today 오후 5:00) 9:24 CRLF UTF-8 4 spaces Python 3.8 (venv_test)

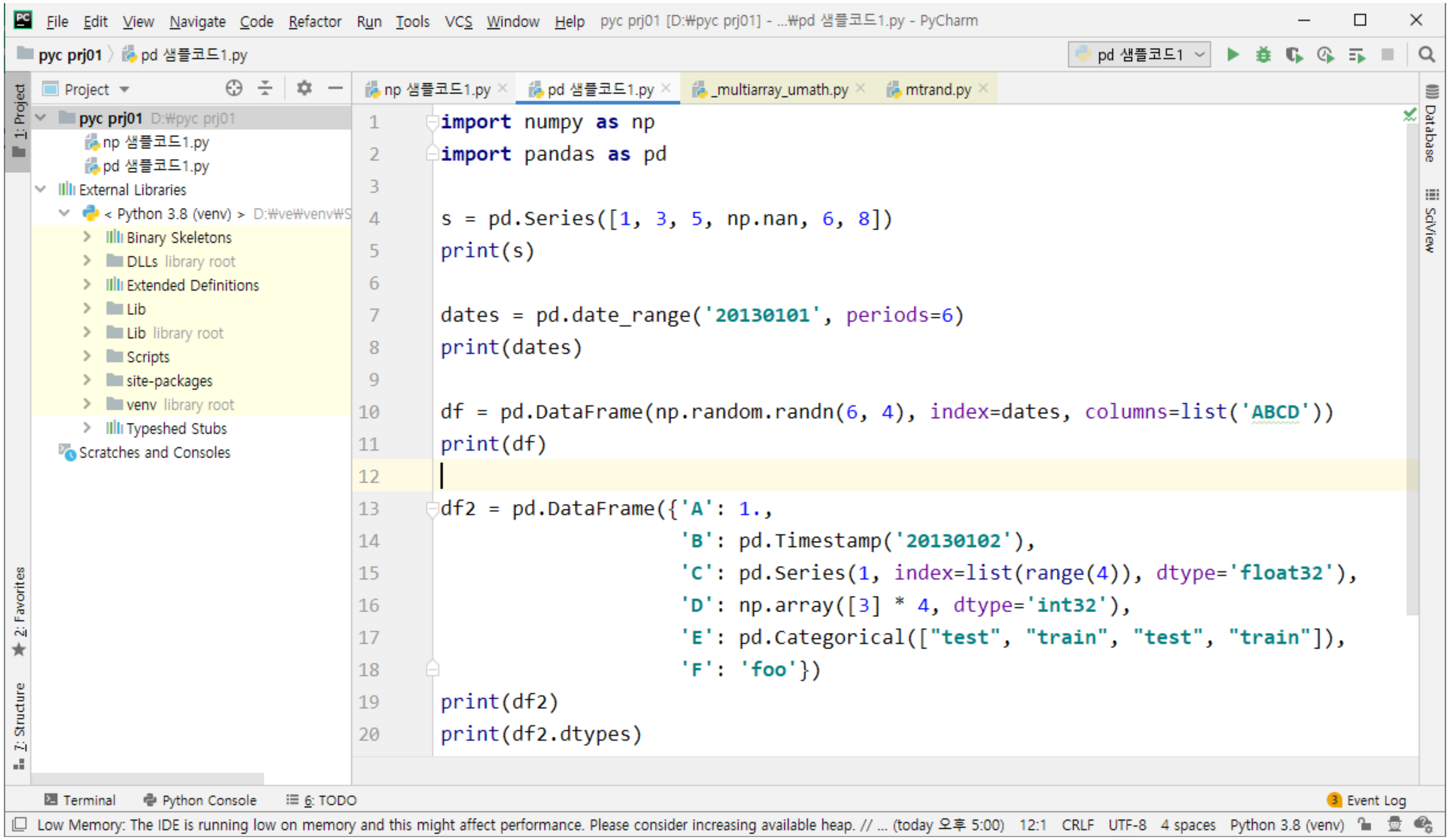
Pandas, pdsample1.py 이해

```python
import numpy as np
import pandas as pd

s = pd.Series([1, 2, 3, 4, 5, 6], index=pd.date_range('20200102', periods=6))
print(s)

s = pd.Series(np.random.randint(0, 7, size=10))
print(s)
print(s.value_counts())

s = pd.Series(['A', 'B', 'C', 'Aaba', 'Baca', np.nan, 'CABA', 'dog', 'cat'])
print(s)
s.str.lower()
print(s)

df = pd.DataFrame(np.random.randn(10, 4))
print(df)
```

```
D:₩ve₩venv_test₩Scripts₩python.exe
"D:/pyc prj02/pd 샘플코드2.py"
2020-01-02    1
2020-01-03    2
2020-01-04    3
2020-01-05    4
2020-01-06    5
2020-01-07    6
Freq: D, dtype: int64
0    5
1    2
2    0
3    5
4    6
5    1
6    6
7    6
8    2
9    4
dtype: int32
6    3
5    2
2    2
4    1
1    1
0    1
dtype: int64
```

```
0       A
1       B
2       C
3    Aaba
4    Baca
5     NaN
6    CABA
7     dog
8     cat
dtype: object
0       A
1       B
2       C
3    Aaba
4    Baca
5     NaN
6    CABA
7     dog
8     cat
dtype: object
          0         1         2         3
0 -0.827856 -0.591318 -0.446506  1.639843
1 -0.455133  0.652168 -0.542553  0.015321
2 -0.790744  0.088498  0.499716 -0.355695
3  0.252766  0.853125  1.609860 -1.235949
4 -0.778862  0.734792 -0.559469  2.637026
5 -0.066913 -2.701452  0.196265 -1.475756
6 -1.171109 -1.312982 -0.123534 -0.467198
7 -0.560191 -0.025275  0.336903 -0.202051
8 -0.472363  2.441893  2.044766  0.685911
9 -0.899807 -1.176664  0.391078  0.148584

Process finished with exit code 0
```

Pandas, pdsample2.py



```python
import numpy as np
import pandas as pd

s = pd.Series([1, 3, 5, np.nan, 6, 8])
print(s)

dates = pd.date_range('20130101', periods=6)
print(dates)

df = pd.DataFrame(np.random.randn(6, 4), index=dates, columns=list('ABCD'))
print(df)

df2 = pd.DataFrame({'A': 1.,
                    'B': pd.Timestamp('20130102'),
                    'C': pd.Series(1, index=list(range(4)), dtype='float32'),
                    'D': np.array([3] * 4, dtype='int32'),
                    'E': pd.Categorical(["test", "train", "test", "train"]),
                    'F': 'foo'})
print(df2)
print(df2.dtypes)
```

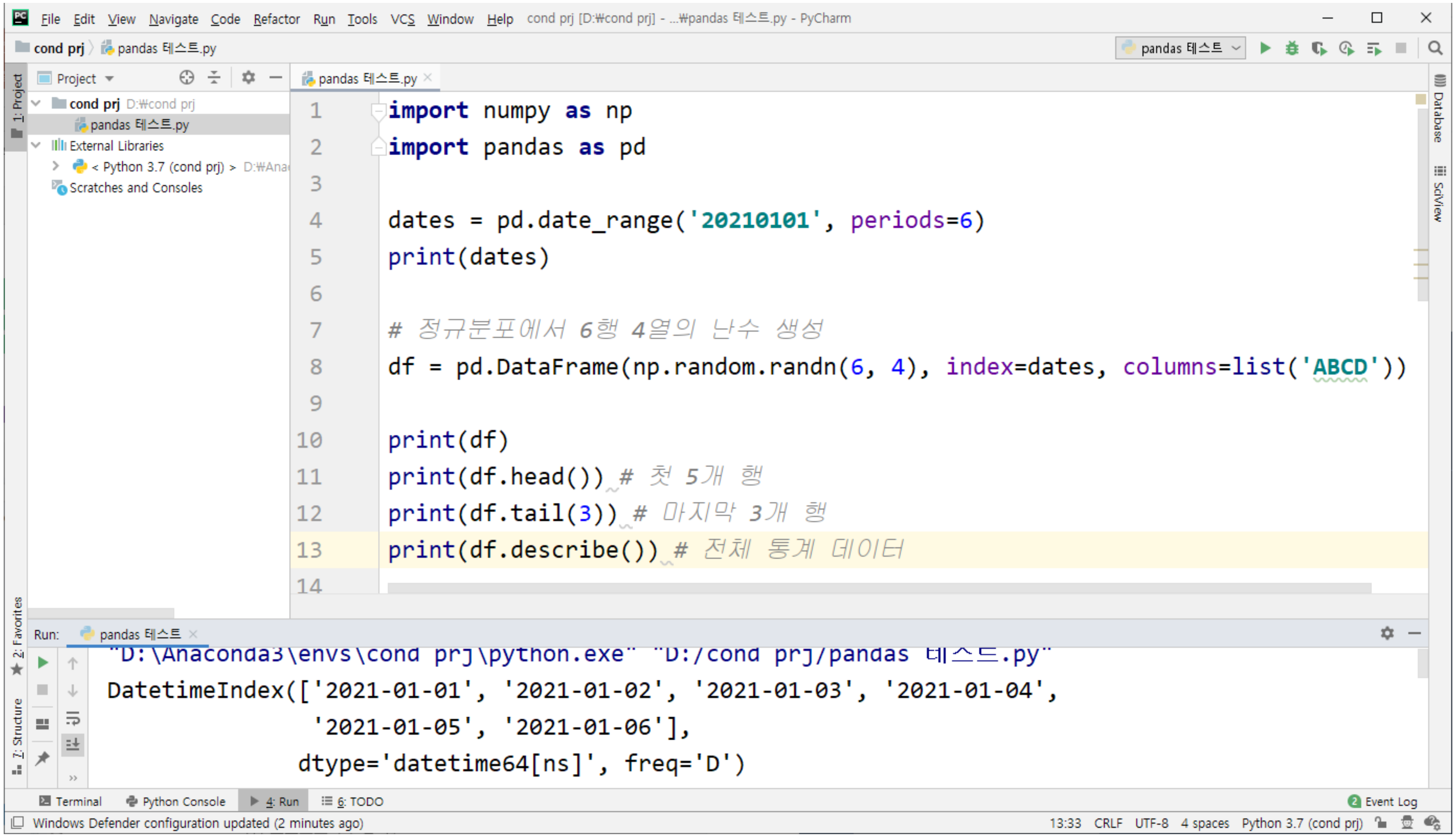
Low Memory: The IDE is running low on memory and this might affect performance. Please consider increasing available heap. // ... (today 오후 5:00) 12:1 CRLF UTF-8 4 spaces Python 3.8 (venv)

Pandas, pdsample2.py 이해

```python
import numpy as np
import pandas as pd

s = pd.Series([1, 3, 5, np.nan, 6, 8])
print(s)

dates = pd.date_range('20130101', periods=6)
print(dates)

df = pd.DataFrame(np.random.randn(6, 4), index=dates,
                                          columns=list('ABCD'))
print(df)

df2 = pd.DataFrame(
         {'A': 1.,
          'B': pd.Timestamp('20130102'),
          'C': pd.Series(1, index=list(range(4)), dtype='float32'),
          'D': np.array([3] * 4, dtype='int32'),
          'E': pd.Categorical(["test", "train", "test", "train"]),
          'F': 'foo'})
print(df2)
print(df2.dtypes)
```

```
D:₩ve₩venv₩Scripts₩python.exe "D:/pyc prj01/pd 샘플코드1.py"
0    1.0
1    3.0
2    5.0
3    NaN
4    6.0
5    8.0
dtype: float64
DatetimeIndex(['2013-01-01', '2013-01-02', '2013-01-03', '2013-01-04',
               '2013-01-05', '2013-01-06'],
              dtype='datetime64[ns]', freq='D')
                   A         B         C         D
2013-01-01  0.617621  0.711937  0.555614  1.261003
2013-01-02 -1.378531 -0.325374  0.788234  1.223037
2013-01-03 -1.228281 -0.682720 -0.564663  0.107814
2013-01-04  0.552391 -0.354623 -0.488619 -0.072650
2013-01-05 -1.099271  0.108479 -2.062795  2.163172
2013-01-06 -0.034693  0.705632  0.194938  0.800431
     A          B    C  D      E    F
0  1.0 2013-01-02  1.0  3   test  foo
1  1.0 2013-01-02  1.0  3  train  foo
2  1.0 2013-01-02  1.0  3   test  foo
3  1.0 2013-01-02  1.0  3  train  foo
A           float64
B    datetime64[ns]
C           float32
D             int32
E          category
F            object
dtype: object

Process finished with exit code 0
```

Pandas, pdsample3.py

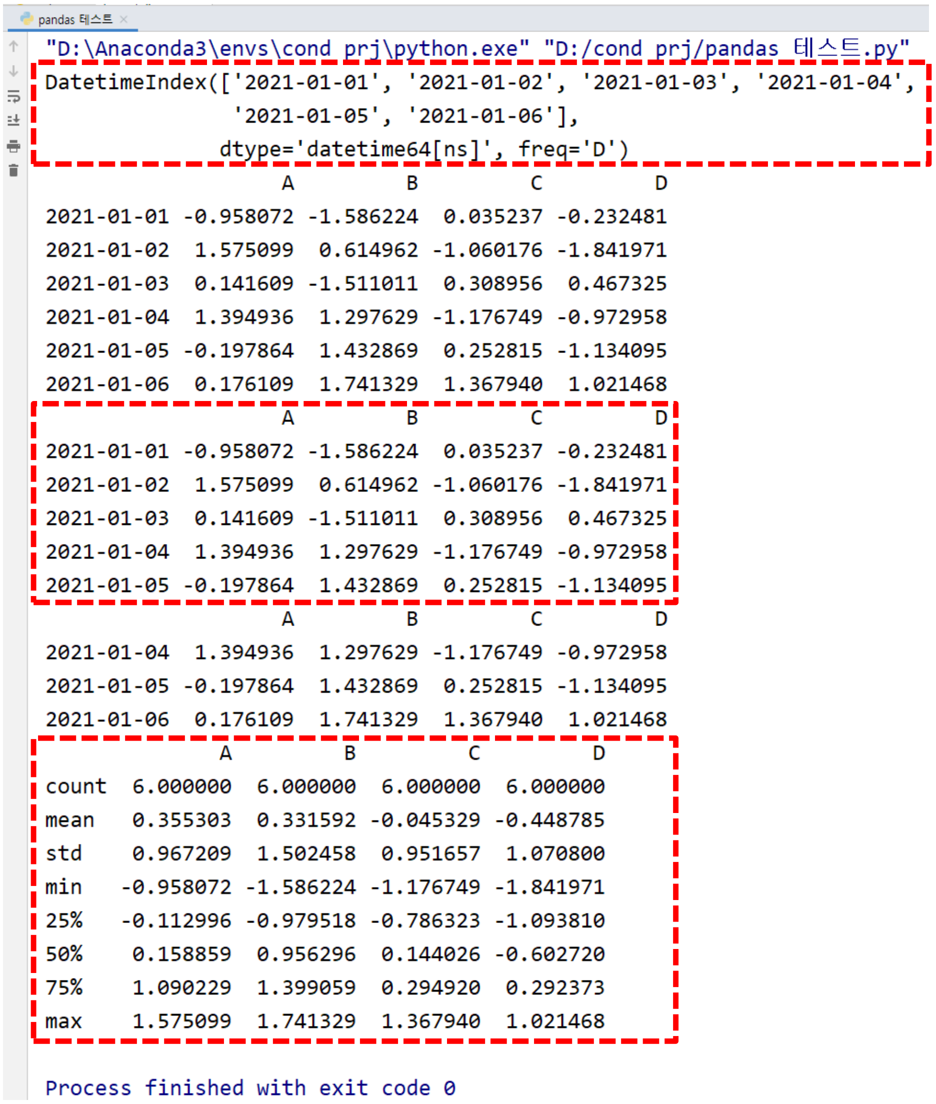

File Edit View Navigate Code Refactor Run Tools VCS Window Help cond prj [D:₩cond prj] - ...₩pandas 테스트.py - PyCharm
cond prj
pandas 테스트.py
Project
cond prj D:₩cond prj
External Libraries
< Python 3.7 (cond prj) > D:₩Ana
Scratches and Consoles
Run: pandas 테스트
Terminal
Python Console
4: Run
6: TODO
Event Log
Windows Defender configuration updated (2 minutes ago)
13:33 CRLF UTF-8 4 spaces Python 3.7 (cond prj)

```python
import numpy as np
import pandas as pd

dates = pd.date_range('20210101', periods=6)
print(dates)

# 정규분포에서 6행 4열의 난수 생성
df = pd.DataFrame(np.random.randn(6, 4), index=dates, columns=list('ABCD'))

print(df)
print(df.head()) # 첫 5개 행
print(df.tail(3)) # 마지막 3개 행
print(df.describe()) # 전체 통계 데이터
```

```
"D:\Anaconda3\envs\cond prj\python.exe" "D:/cond prj/pandas 테스트.py"
DatetimeIndex(['2021-01-01', '2021-01-02', '2021-01-03', '2021-01-04',
               '2021-01-05', '2021-01-06'],
              dtype='datetime64[ns]', freq='D')
```

Pandas, pdsample3.py 이해

```python
import numpy as np
import pandas as pd

dates = pd.date_range('20210101', periods=6)
print(dates)

# 정규분포에서 6행 4열의 난수 생성
df = pd.DataFrame(np.random.randn(6, 4),
     index=dates, columns=list('ABCD'))

print(df)
print(df.head()) # 첫 5개 행
print(df.tail(3)) # 마지막 3개 행
print(df.describe()) # 전체 통계 데이터
```



pandas 테스트

```
"D:\Anaconda3\envs\cond_prj\python.exe" "D:/cond_prj/pandas_테스트.py"
DatetimeIndex(['2021-01-01', '2021-01-02', '2021-01-03', '2021-01-04',
               '2021-01-05', '2021-01-06'],
              dtype='datetime64[ns]', freq='D')
                   A         B         C         D
2021-01-01 -0.958072 -1.586224  0.035237 -0.232481
2021-01-02  1.575099  0.614962 -1.060176 -1.841971
2021-01-03  0.141609 -1.511011  0.308956  0.467325
2021-01-04  1.394936  1.297629 -1.176749 -0.972958
2021-01-05 -0.197864  1.432869  0.252815 -1.134095
2021-01-06  0.176109  1.741329  1.367940  1.021468
                   A         B         C         D
2021-01-01 -0.958072 -1.586224  0.035237 -0.232481
2021-01-02  1.575099  0.614962 -1.060176 -1.841971
2021-01-03  0.141609 -1.511011  0.308956  0.467325
2021-01-04  1.394936  1.297629 -1.176749 -0.972958
2021-01-05 -0.197864  1.432869  0.252815 -1.134095
                   A         B         C         D
2021-01-04  1.394936  1.297629 -1.176749 -0.972958
2021-01-05 -0.197864  1.432869  0.252815 -1.134095
2021-01-06  0.176109  1.741329  1.367940  1.021468
              A         B         C         D
count  6.000000  6.000000  6.000000  6.000000
mean   0.355303  0.331592 -0.045329 -0.448785
std    0.967209  1.502458  0.951657  1.070800
min   -0.958072 -1.586224 -1.176749 -1.841971
25%   -0.112996 -0.979518 -0.786323 -1.093810
50%    0.158859  0.956296  0.144026 -0.602720
75%    1.090229  1.399059  0.294920  0.292373
max    1.575099  1.741329  1.367940  1.021468

Process finished with exit code 0
```

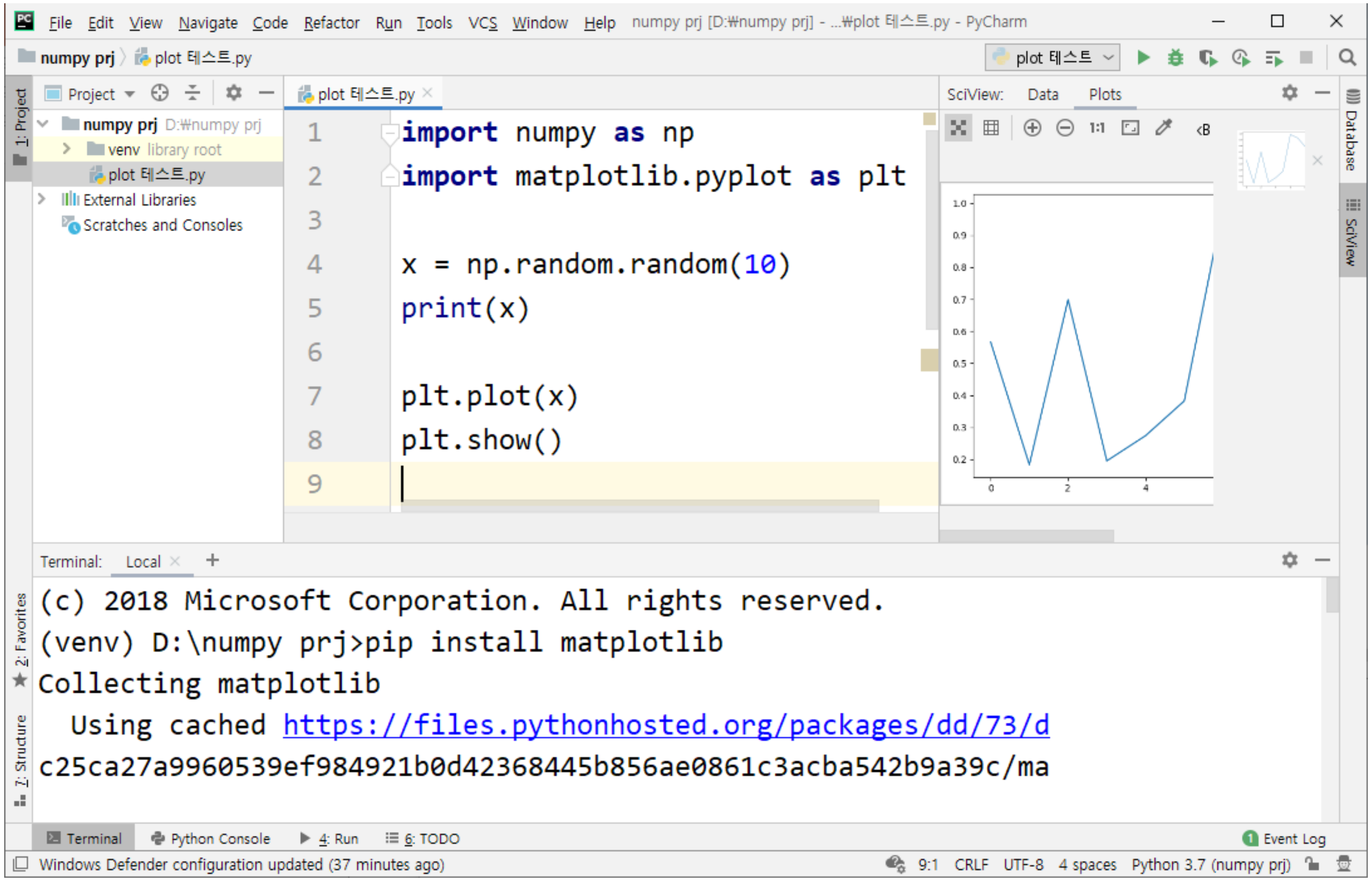
파이참 프로젝트에서 데이터 시각화를 위한 준비 matplotlib

Matplotlib, matplot1.py

- pip install matplotlib

> pip show matplotlib

설치 유무 확인 방법

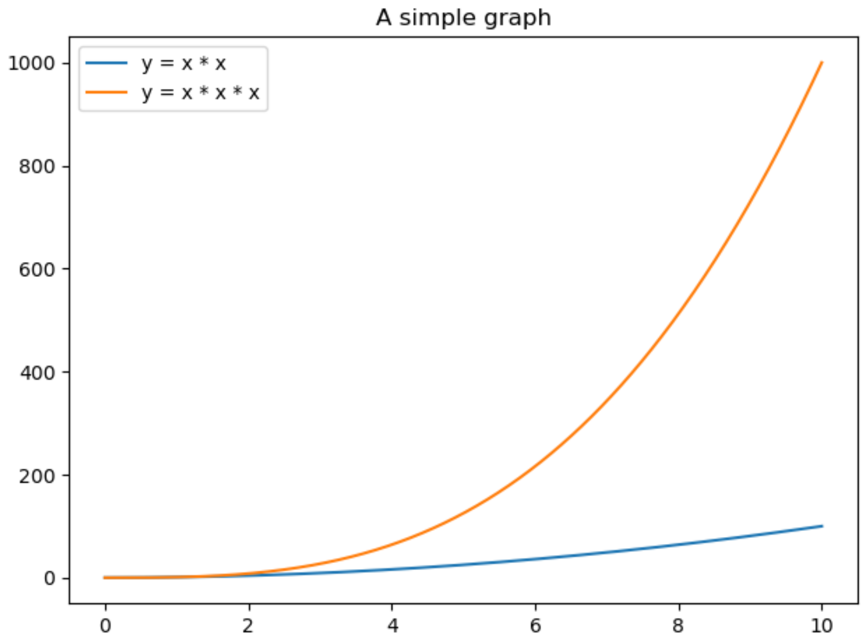

File Edit View Navigate Code Refactor Run Tools VCS Window Help numpy prj [D:₩numpy prj] - ...₩plot 테스트.py - PyCharm
numpy prj
plot 테스트.py
Project
numpy prj D:₩numpy prj
venv library root
External Libraries
Scratches and Consoles
SciView: Data Plots
Terminal: Local
Terminal
Python Console
4: Run
6: TODO
Event Log
Windows Defender configuration updated (37 minutes ago)
9:1 CRLF UTF-8 4 spaces Python 3.7 (numpy prj)

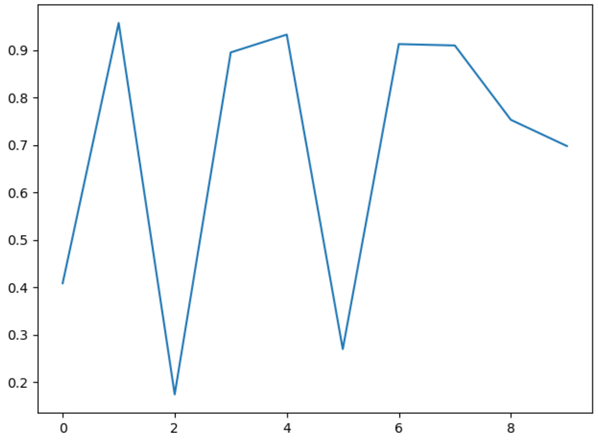
```python
import numpy as np
import matplotlib.pyplot as plt

x = np.random.random(10)
print(x)

plt.plot(x)
plt.show()
```

```
(c) 2018 Microsoft Corporation. All rights reserved.
(venv) D:\numpy prj>pip install matplotlib
Collecting matplotlib
  Using cached https://files.pythonhosted.org/packages/dd/73/d
c25ca27a9960539ef984921b0d42368445b856ae0861c3acba542b9a39c/ma
```

Matplotlib, matplot1.py 이해

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

x = np.random.random(10)
print(x)
plt.plot(x)
plt.show()

x = np.linspace(0.0, 10.0, 1000)

plt.plot(x, x*x)
plt.plot(x, x**3)
plt.title('A simple graph')
plt.legend(['y = x * x', 'y = x * x * x'], loc='upper left')
plt.show()
```

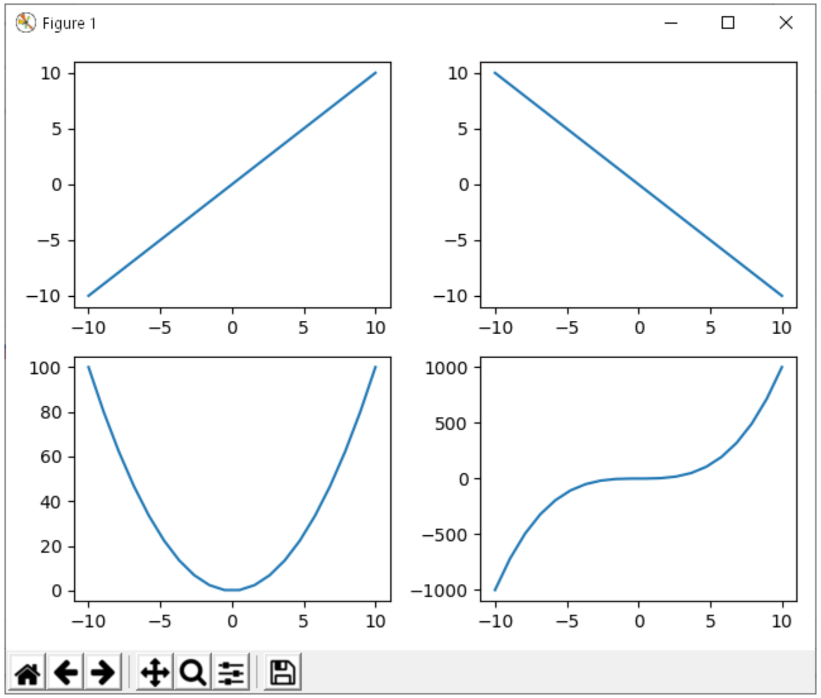




Matplotlib, matplot2.py 이해

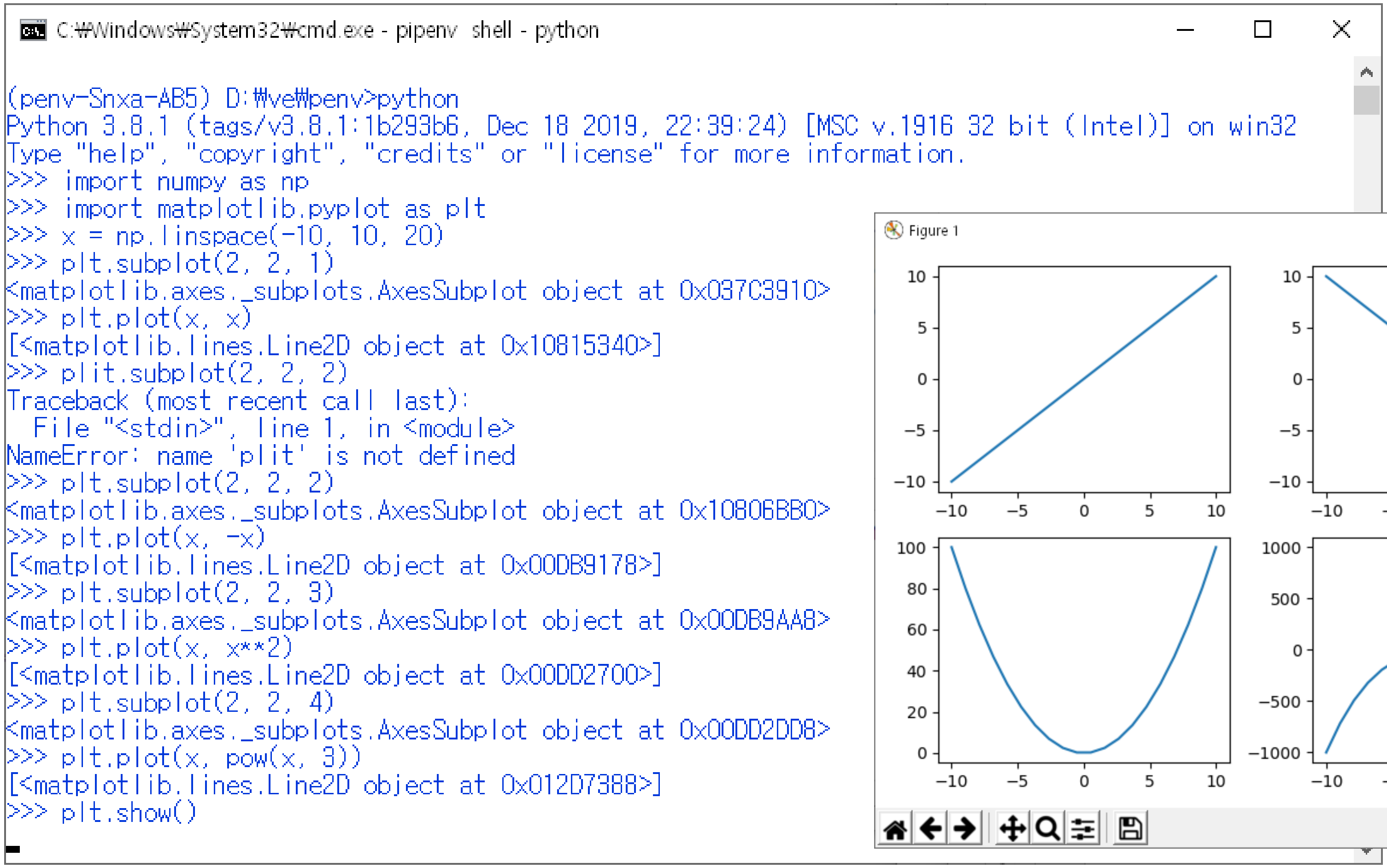
- 여러 그림을 하나의 캔버스에 그리는 방법

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

# -10에서 10까지 20등분한 자료
x = np.linspace(-10, 10, 20)

# 2행 2열의 부분 그림
plt.subplot(2, 2, 1) # 첫 번째 부분 그림
plt.plot(x, x)
plt.subplot(2, 2, 2) # 두 번째 부분 그림
plt.plot(x, -x)
plt.subplot(2, 2, 3) # 세 번째 부분 그림
plt.plot(x, x*x)
plt.subplot(2, 2, 4) # 네 번째 부분 그림
plt.plot(x, pow(x, 3))

plt.tight_layout() # 적정한 공간 배치
plt.show() # 그리기
```



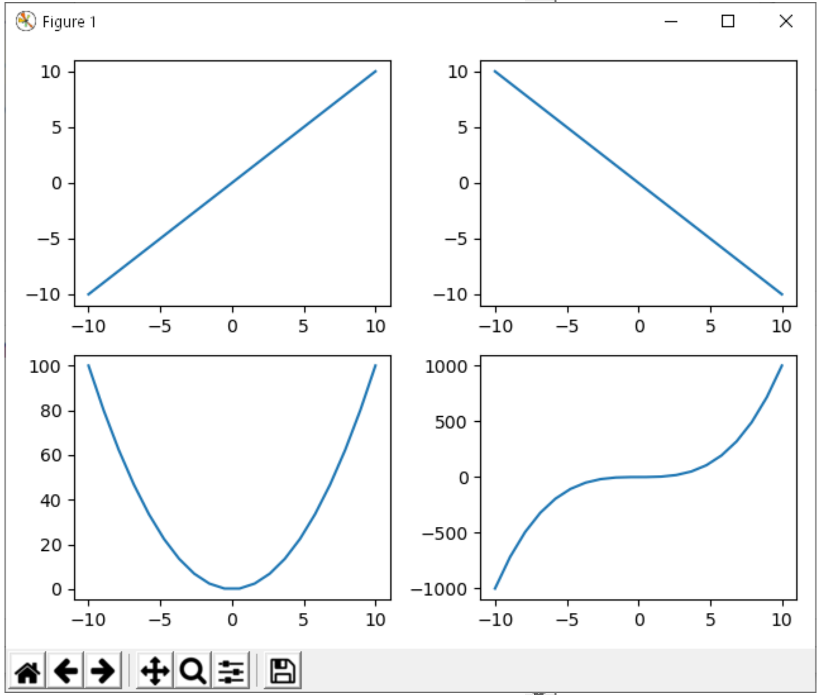
Matplotlib, matplot2.py 쉘에서 코딩

- Python 실행

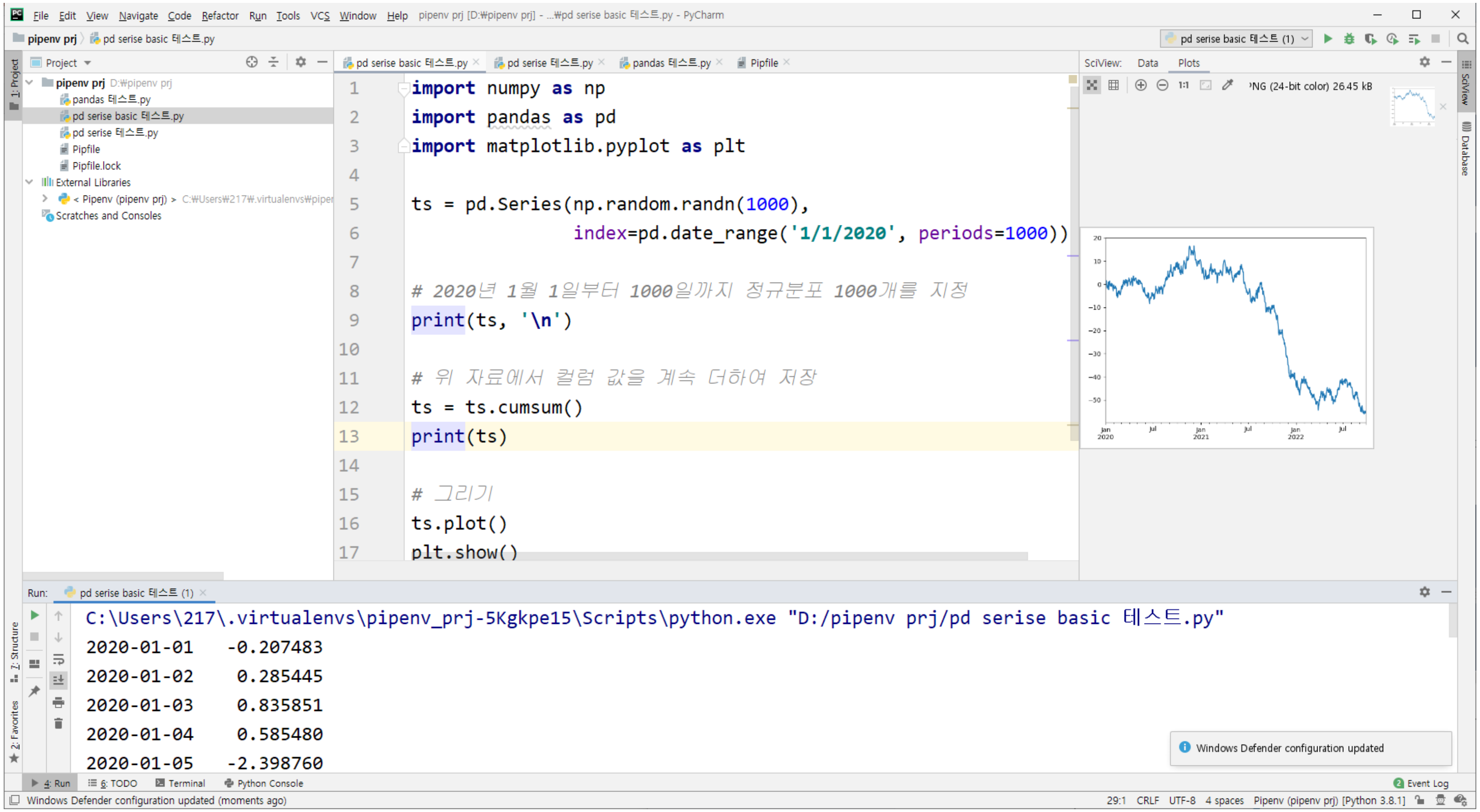


C:₩Windows₩System32₩cmd.exe - pipenv shell - python

```
(penv-Snxa-AB5) D:₩ve₩penv>python
Python 3.8.1 (tags/v3.8.1:1b293b6, Dec 18 2019, 22:39:24) [MSC v.1916 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> import numpy as np
>>> import matplotlib.pyplot as plt
>>> x = np.linspace(-10, 10, 20)
>>> plt.subplot(2, 2, 1)
<matplotlib.axes._subplots.AxesSubplot object at 0x037C3910>
>>> plt.plot(x, x)
[<matplotlib.lines.Line2D object at 0x10815340>]
>>> plit.subplot(2, 2, 2)
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
NameError: name 'plit' is not defined
>>> plt.subplot(2, 2, 2)
<matplotlib.axes._subplots.AxesSubplot object at 0x10806BB0>
>>> plt.plot(x, -x)
[<matplotlib.lines.Line2D object at 0x00DB9178>]
>>> plt.subplot(2, 2, 3)
<matplotlib.axes._subplots.AxesSubplot object at 0x00DB9AA8>
>>> plt.plot(x, x**2)
[<matplotlib.lines.Line2D object at 0x00DD2700>]
>>> plt.subplot(2, 2, 4)
<matplotlib.axes._subplots.AxesSubplot object at 0x00DD2DD8>
>>> plt.plot(x, pow(x, 3))
[<matplotlib.lines.Line2D object at 0x012D7388>]
>>> plt.show()
```



Matplotlib, matplot3.py


File Edit View Navigate Code Refactor Run Tools VCS Window Help pipenv prj [D:₩pipenv prj] - ...₩pd serise basic 테스트.py - PyCharm
pipenv prj
pd serise basic 테스트.py
pd serise basic 테스트 (1)
Project
pipenv prj D:₩pipenv prj
pandas 테스트.py
pd serise basic 테스트.py
pd serise 테스트.py
Pipfile
Pipfile.lock
External Libraries
< Pipenv (pipenv prj) > C:₩Users₩217₩.virtualenvs₩pipen
Scratches and Consoles
pd serise basic 테스트.py
pd serise 테스트.py
pandas 테스트.py
Pipfile
SciView: Data Plots
PNG (24-bit color) 26.45 kB
Run: pd serise basic 테스트 (1)
Windows Defender configuration updated
4: Run
6: TODO
Terminal
Python Console
Event Log
Windows Defender configuration updated (moments ago)
29:1 CRLF UTF-8 4 spaces Pipenv (pipenv prj) [Python 3.8.1]

```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

ts = pd.Series(np.random.randn(1000),
               index=pd.date_range('1/1/2020', periods=1000))

# 2020년 1월 1일부터 1000일까지 정규분포 1000개를 지정
print(ts, '\n')

# 위 자료에서 컬럼 값을 계속 더하여 저장
ts = ts.cumsum()
print(ts)

# 그리기
ts.plot()
plt.show()
```

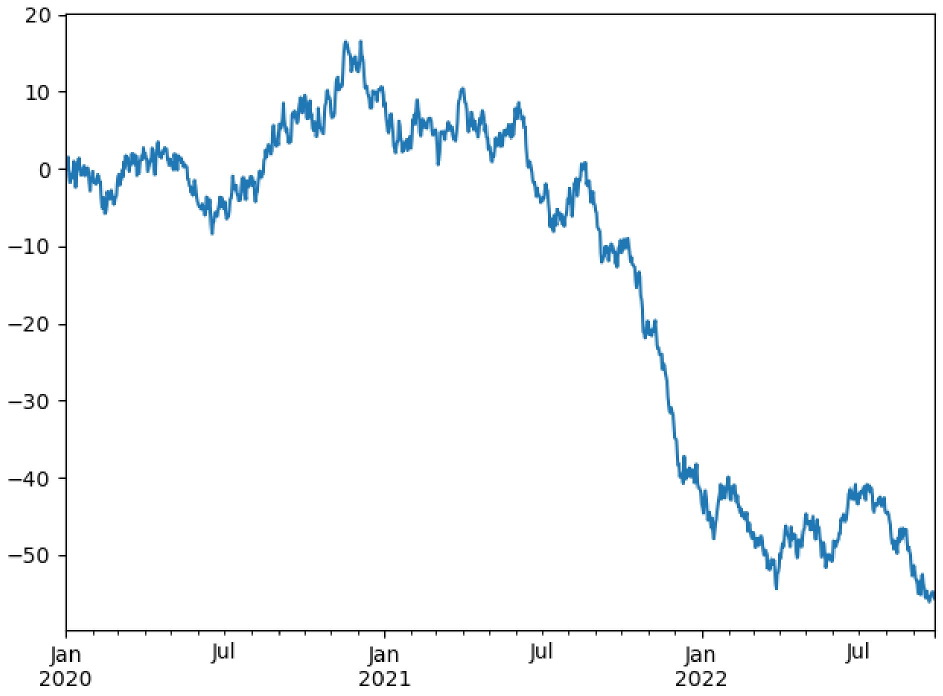
```
C:\Users\217\.virtualenvs\pipenv_prj-5Kgkpe15\Scripts\python.exe "D:/pipenv prj/pd serise basic 테스트.py"
2020-01-01   -0.207483
2020-01-02    0.285445
2020-01-03    0.835851
2020-01-04    0.585480
2020-01-05   -2.398760
```

Matplotlib, matplot3.py 이해

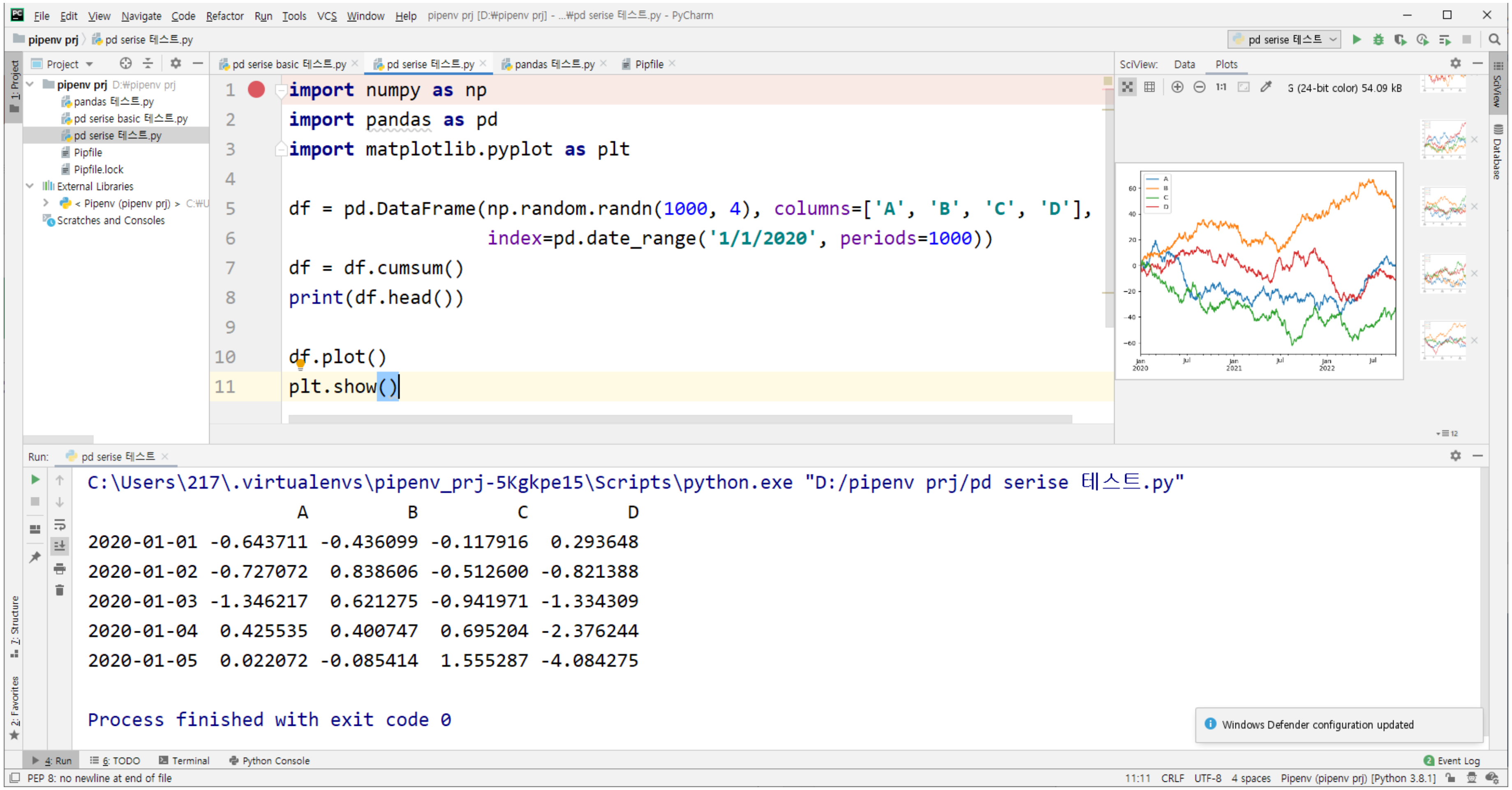
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

# Series는 1차원 데이터를 다루는 데 효과적인 자료구조
# value와 index의 형태를 지니는 Pandas의 자료 구조
# 별도의 인덱스 레이블을 지정하지 않으면 자동적으로
# 0부터 시작되는 디폴트 정수 인덱스를 사용
# 다음은 인덱스를 날짜 1000개로 지정, 자료 값은 난수 1000개
# 즉 2020년 1월 1일부터 1000일까지 정규분포 1000개를 지정
ts = pd.Series(np.random.randn(1000), index=pd.date_range('1/1/2020', periods=1000))
print(ts, '\n')

# 위 자료에서 컬럼 값을 계속 더하여 저장
ts = ts.cumsum()
print(ts)

# 그리기
ts.plot()
plt.show()
```

```
2020-01-01    -0.207483
2020-01-02     0.285445
2020-01-03     0.835851
```

```
2020-01-01    -0.207483
2020-01-02     0.077963
2020-01-03     0.913813
```



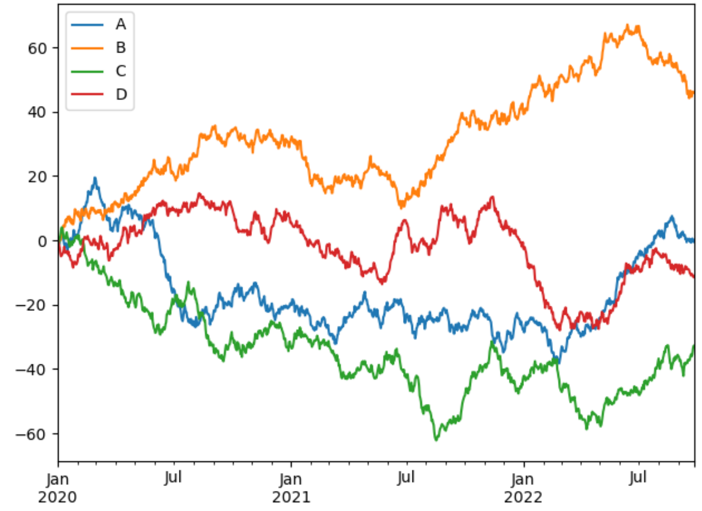
Matplotlib, matplot4.py



```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

df = pd.DataFrame(np.random.randn(1000, 4), columns=['A', 'B', 'C', 'D'],
                  index=pd.date_range('1/1/2020', periods=1000))
df = df.cumsum()
print(df.head())

df.plot()
plt.show()
```

```
C:\Users\217\.virtualenvs\pipenv_prj-5Kgkpe15\Scripts\python.exe "D:/pipenv prj/pd serise 테스트.py"
                   A         B         C         D
2020-01-01 -0.643711 -0.436099 -0.117916  0.293648
2020-01-02 -0.727072  0.838606 -0.512600 -0.821388
2020-01-03 -1.346217  0.621275 -0.941971 -1.334309
2020-01-04  0.425535  0.400747  0.695204 -2.376244
2020-01-05  0.022072 -0.085414  1.555287 -4.084275

Process finished with exit code 0
```

Matplotlib, matplot3.py 이해



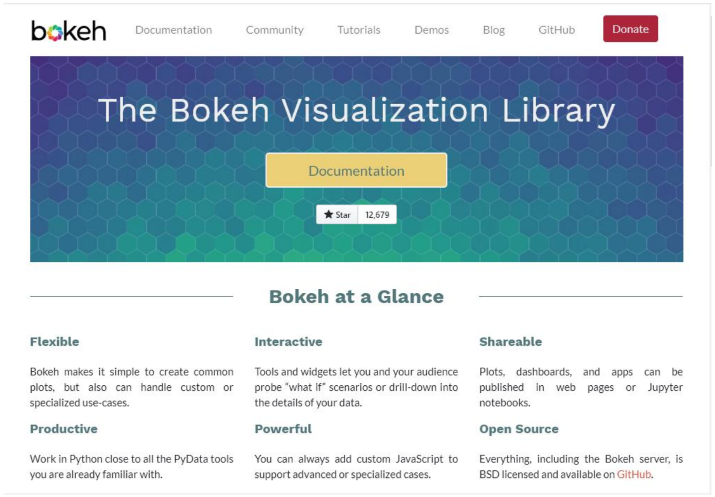
```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

df = pd.DataFrame(np.random.randn(1000, 4), columns=['A', 'B', 'C', 'D'],
                  index=pd.date_range('1/1/2020', periods=1000))
df = df.cumsum()
print(df.head())

df.plot()
plt.show()
```

```
                   A         B         C         D
2020-01-01 -0.643711 -0.436099 -0.117916  0.293648
2020-01-02 -0.727072  0.838606 -0.512600 -0.821388
2020-01-03 -1.346217  0.621275 -0.941971 -1.334309
2020-01-04  0.425535  0.400747  0.695204 -2.376244
2020-01-05  0.022072 -0.085414  1.555287 -4.084275
```

파이참 프로젝트에서 데이터 시각화를 위한 준비 bokeh

Bokeh 개요

- **Bokeh.org**
  - 최신 웹 브라우저를 위한 대화 형 시각화 라이브러리
    - **다목적 그래픽의 우아하고 간결한 구성을 제공**
    - **대용량 또는 스트리밍 데이터 세트에 대한 고성능 대화식 기능을 제공**
  - 대화 형 플롯, 대시 보드 및 데이터 응용 프로그램을 빠르고 쉽게 만들고 싶은 사람에게 적합
  - Bokeh를 사용하여 시각화를 시작하려면
    - **사용 설명서로 시작**
      - https://docs.bokeh.org/en/latest/docs/user_guide/quickstart.html#userguide-quickstart



The Bokeh Visualization Library

Bokeh at a Glance

Flexible

Bokeh makes it simple to create common plots, but also can handle custom or specialized use-cases.

Interactive

Tools and widgets let you and your audience probe "what if" scenarios or drill-down into the details of your data.

Shareable

Plots, dashboards, and apps can be published in web pages or Jupyter notebooks.

Productive

Work in Python close to all the PyData tools you are already familiar with.

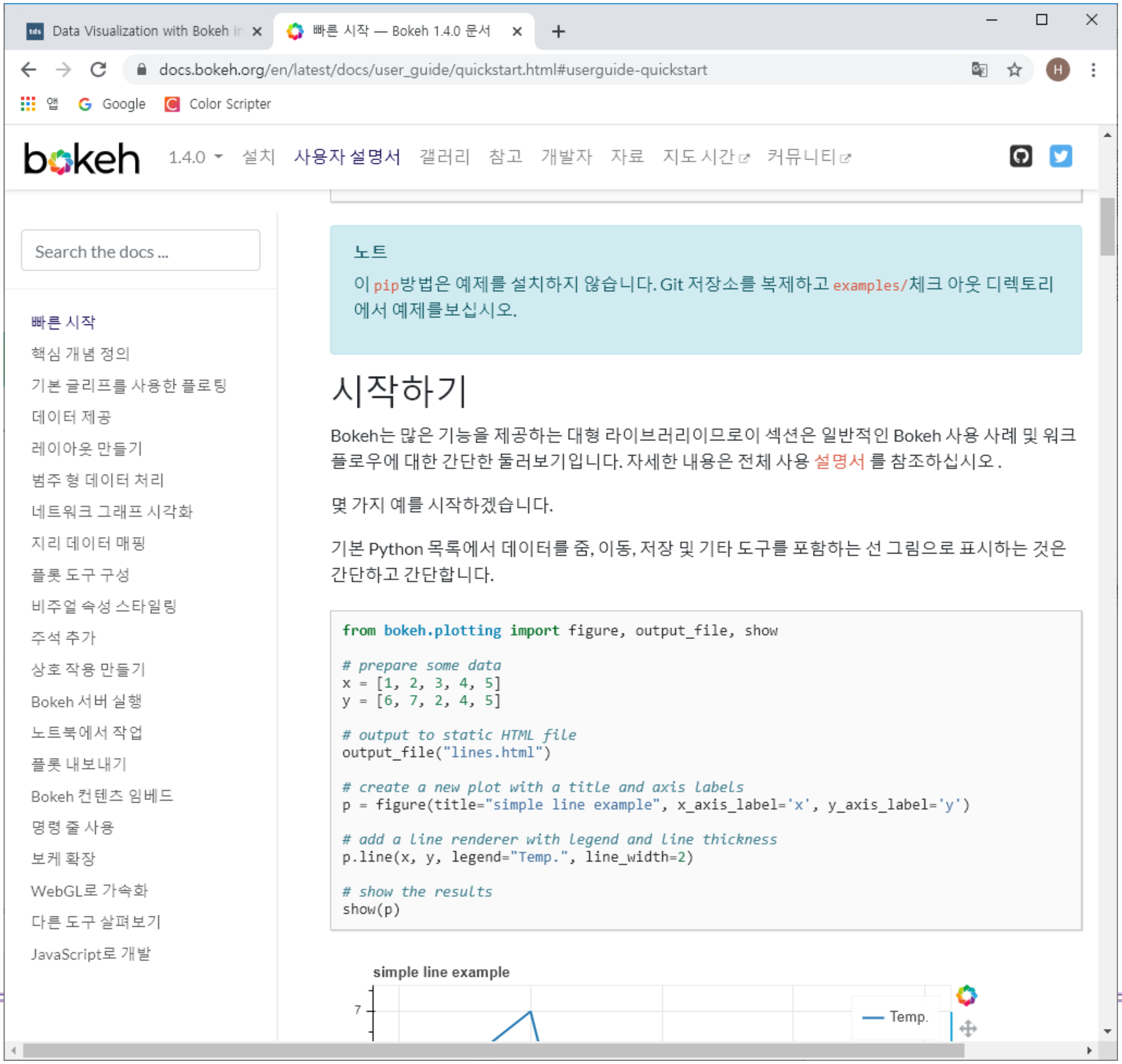
Powerful

You can always add custom JavaScript to support advanced or specialized cases.

Open Source

Everything, including the Bokeh server, is BSD licensed and available on GitHub.

보케 가이드 페이지



노트

이 pip방법은 예제를 설치하지 않습니다. Git 저장소를 복제하고 examples/체크 아웃 디렉토리에서 예제를보십시오.

시작하기

Bokeh는 많은 기능을 제공하는 대형 라이브러리이므로이 섹션은 일반적인 Bokeh 사용 사례 및 워크플로우에 대한 간단한 둘러보기입니다. 자세한 내용은 전체 사용 설명서 를 참조하십시오 .

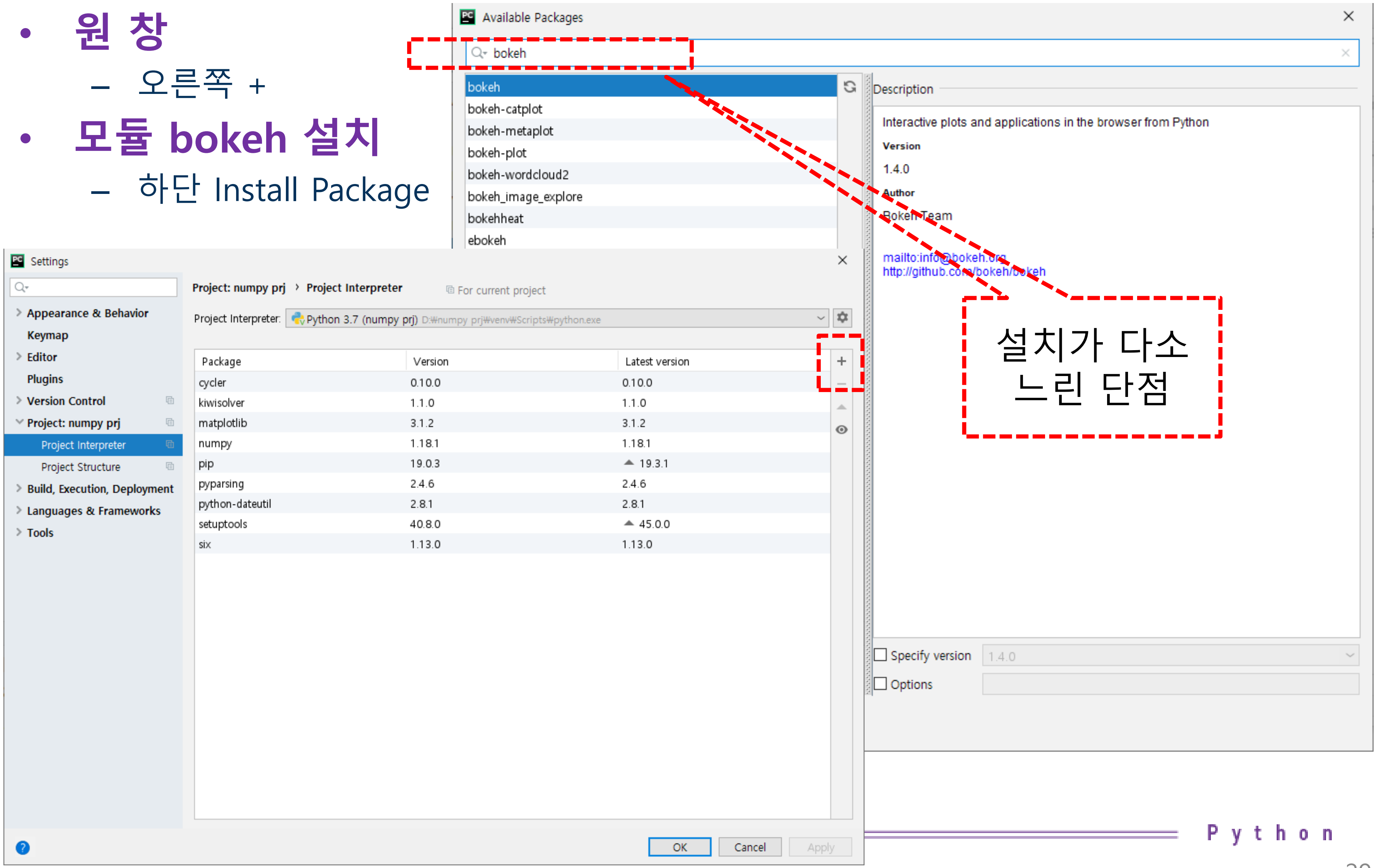
몇 가지 예를 시작하겠습니다.

기본 Python 목록에서 데이터를 줌, 이동, 저장 및 기타 도구를 포함하는 선 그림으로 표시하는 것은 간단하고 간단합니다.

```python
from bokeh.plotting import figure, output_file, show

# prepare some data
x = [1, 2, 3, 4, 5]
y = [6, 7, 2, 4, 5]

# output to static HTML file
output_file("lines.html")

# create a new plot with a title and axis labels
p = figure(title="simple line example", x_axis_label='x', y_axis_label='y')

# add a line renderer with legend and line thickness
p.line(x, y, legend="Temp.", line_width=2)

# show the results
show(p)
```

Settings... 에서 모듈 추가하기

- 원 창
  - 오른쪽 +
- 모듈 bokeh 설치
  - 하단 Install Package



Available Packages

bokeh

- bokeh
- bokeh-catplot
- bokeh-metaplot
- bokeh-plot
- bokeh-wordcloud2
- bokeh_image_explore
- bokehheat
- ebokeh

Description

Interactive plots and applications in the browser from Python

Version

1.4.0

Author

Bokeh Team

mailto:info@bokeh.org
http://github.com/bokeh/bokeh

☐ Specify version 1.4.0

☐ Options

Settings

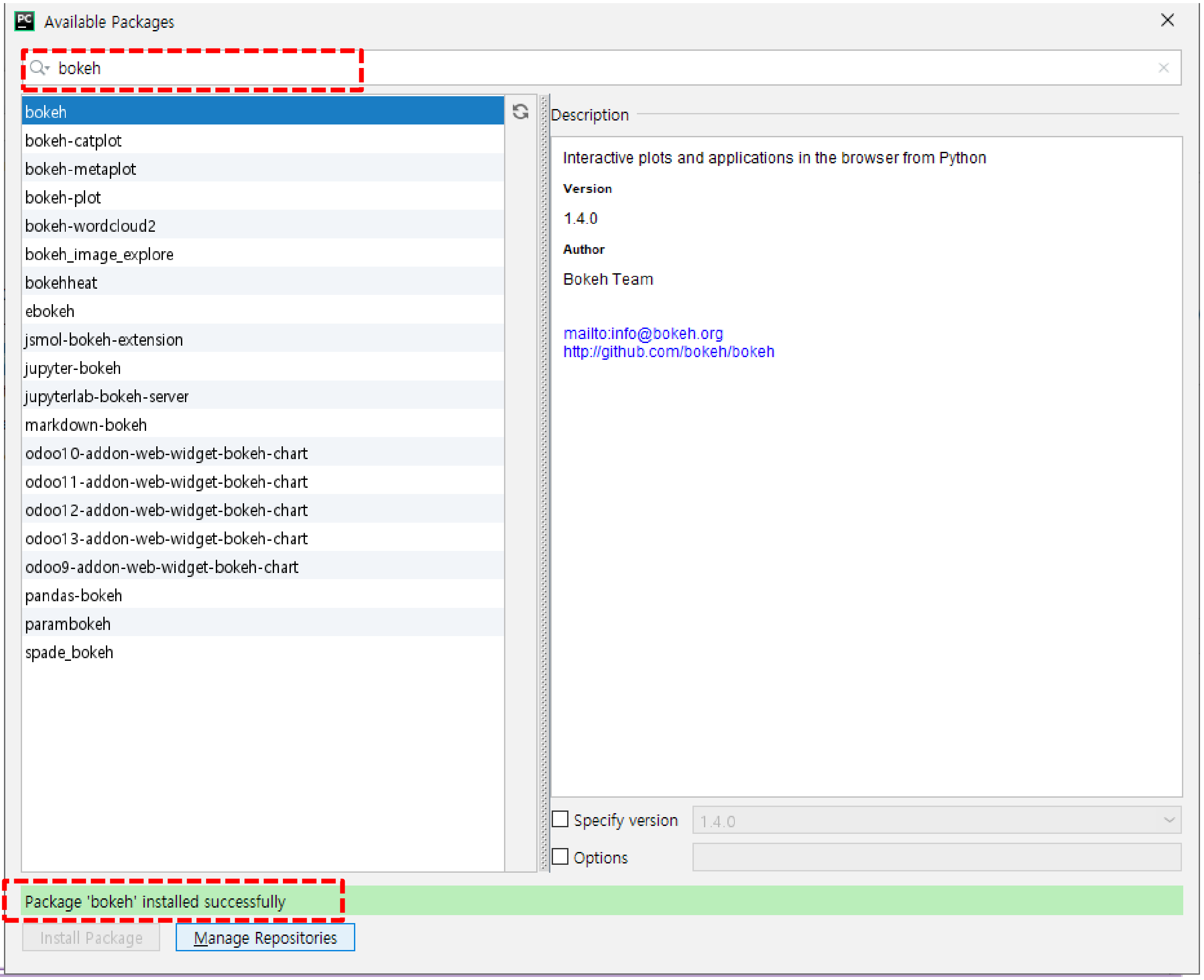
Project: numpy prj › Project Interpreter   For current project

Project Interpreter: Python 3.7 (numpy prj) D:₩numpy prj₩venv₩Scripts₩python.exe

Package	Version	Latest version
cycler	0.10.0	0.10.0
kiwisolver	1.1.0	1.1.0
matplotlib	3.1.2	3.1.2
numpy	1.18.1	1.18.1
pip	19.0.3	▲ 19.3.1
pyparsing	2.4.6	2.4.6
python-dateutil	2.8.1	2.8.1
setuptools	40.8.0	▲ 45.0.0
six	1.13.0	1.13.0

설치가 다소 느린 단점

모듈 bokeh 설치 화면



bokeh
bokeh-catplot
bokeh-metaplot
bokeh-plot
bokeh-wordcloud2
bokeh_image_explore
bokehheat
ebokeh
jsmol-bokeh-extension
jupyter-bokeh
jupyterlab-bokeh-server
markdown-bokeh
odoo10-addon-web-widget-bokeh-chart
odoo11-addon-web-widget-bokeh-chart
odoo12-addon-web-widget-bokeh-chart
odoo13-addon-web-widget-bokeh-chart
odoo9-addon-web-widget-bokeh-chart
pandas-bokeh
parambokeh
spade_bokeh

Interactive plots and applications in the browser from Python

Version

1.4.0

Author

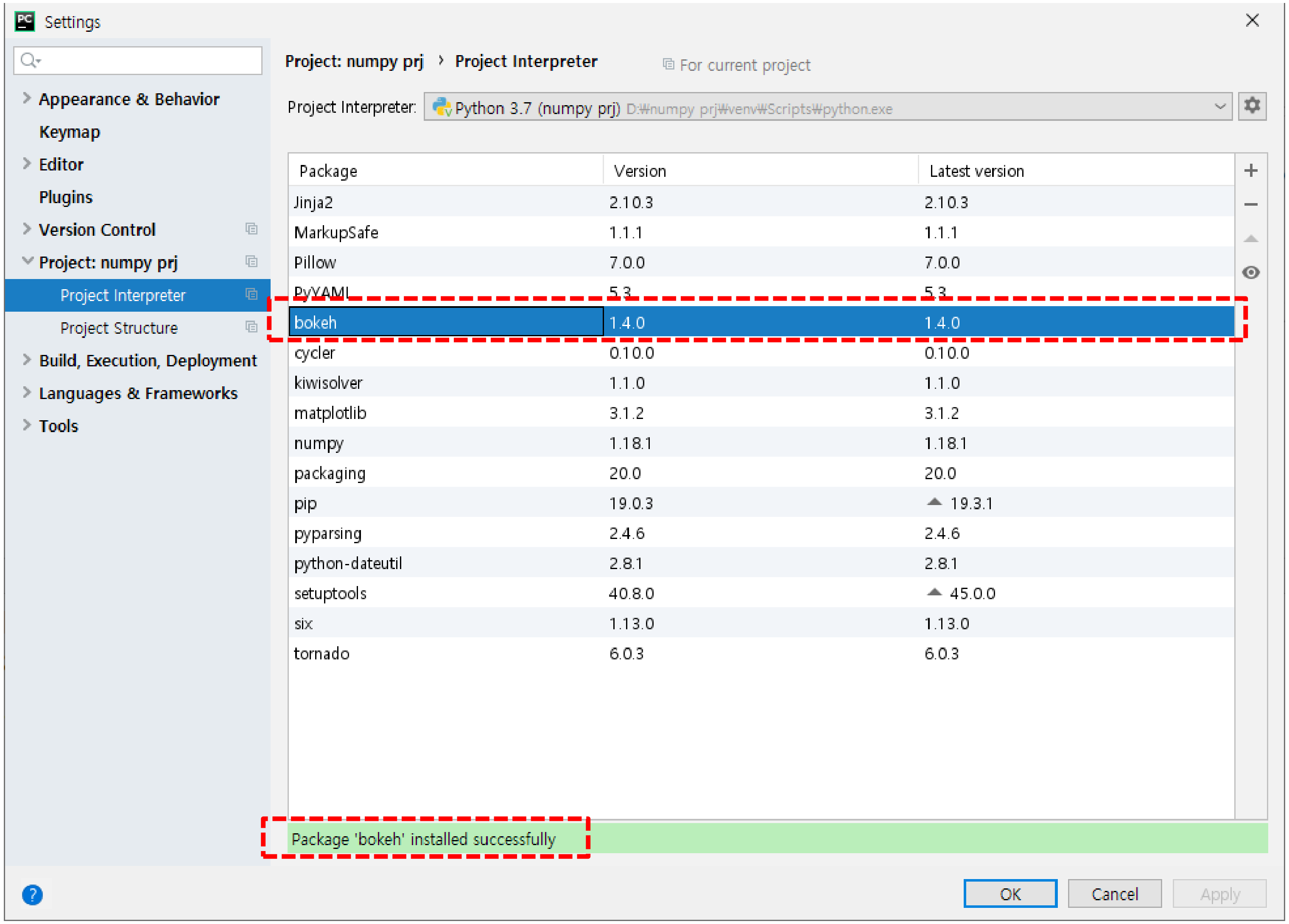
Bokeh Team

mailto:info@bokeh.org
http://github.com/bokeh/bokeh

1.4.0

Package 'bokeh' installed successfully

Settings 화면



Project: numpy prj › Project Interpreter   For current project

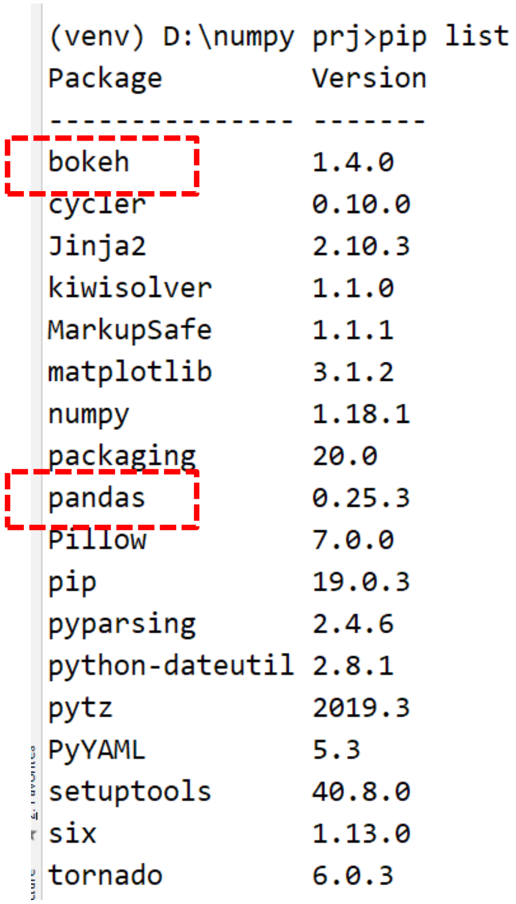
Project Interpreter: Python 3.7 (numpy prj) D:₩numpy prj₩venv₩Scripts₩python.exe

Package	Version	Latest version
Jinja2	2.10.3	2.10.3
MarkupSafe	1.1.1	1.1.1
Pillow	7.0.0	7.0.0
PyYAML	5.3	5.3
bokeh	1.4.0	1.4.0
cycler	0.10.0	0.10.0
kiwisolver	1.1.0	1.1.0
matplotlib	3.1.2	3.1.2
numpy	1.18.1	1.18.1
packaging	20.0	20.0
pip	19.0.3	▲ 19.3.1
pyparsing	2.4.6	2.4.6
python-dateutil	2.8.1	2.8.1
setuptools	40.8.0	▲ 45.0.0
six	1.13.0	1.13.0
tornado	6.0.3	6.0.3

Package 'bokeh' installed successfully

Bokeh 터미널 설치도 물론 가능

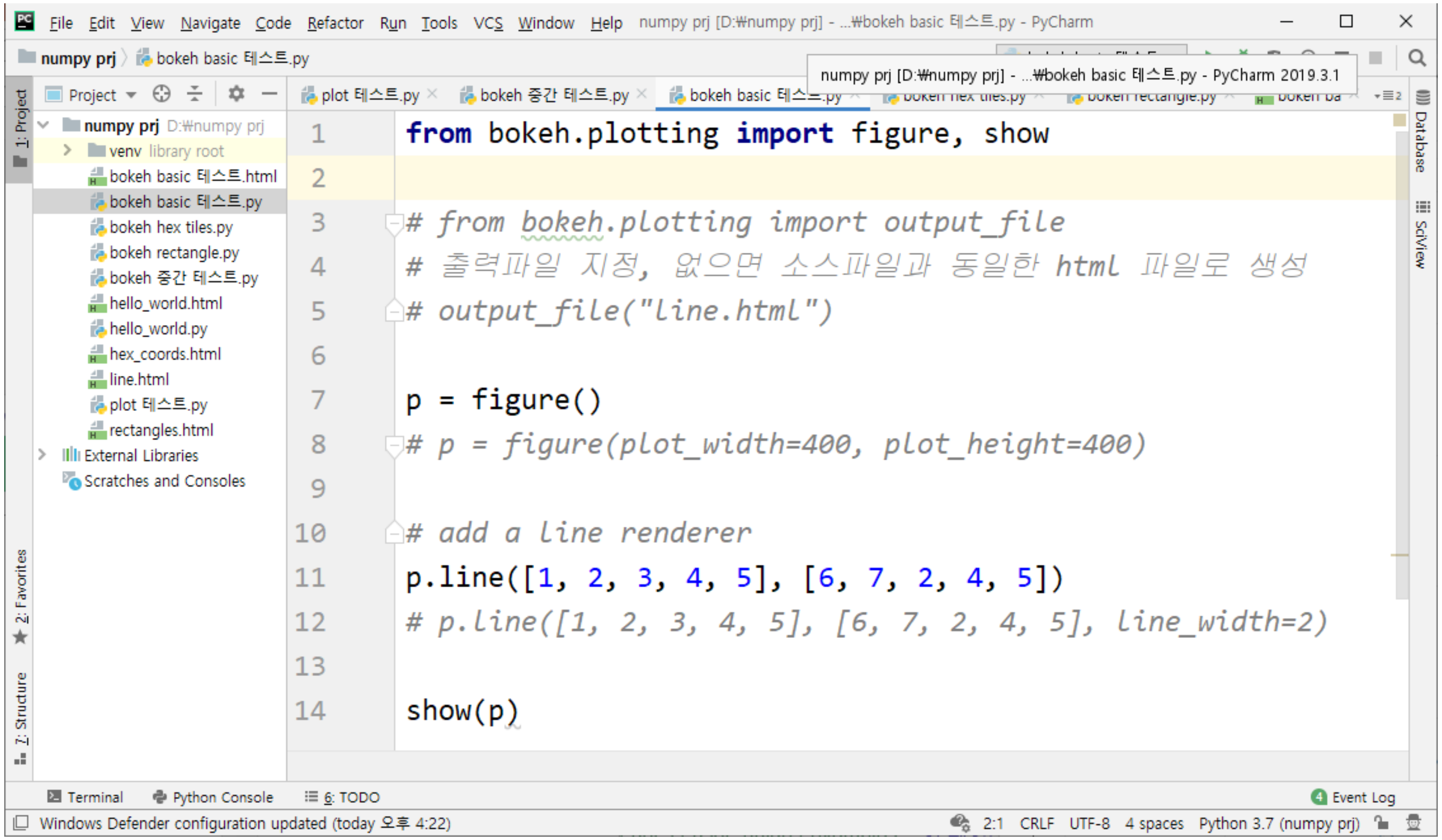
- **터미널에서 설치**
  - pip install bokeh
- **확인**
  - pip list
  - pip show bokeh



```
(venv) D:\numpy prj>pip list
Package          Version
---------------- -------
bokeh            1.4.0
cycler           0.10.0
Jinja2           2.10.3
kiwisolver       1.1.0
MarkupSafe       1.1.1
matplotlib       3.1.2
numpy            1.18.1
packaging        20.0
pandas           0.25.3
Pillow           7.0.0
pip              19.0.3
pyparsing        2.4.6
python-dateutil  2.8.1
pytz             2019.3
PyYAML           5.3
setuptools       40.8.0
six              1.13.0
tornado          6.0.3
```

Bokeh, bksample1.py

- 결과는 html 파일

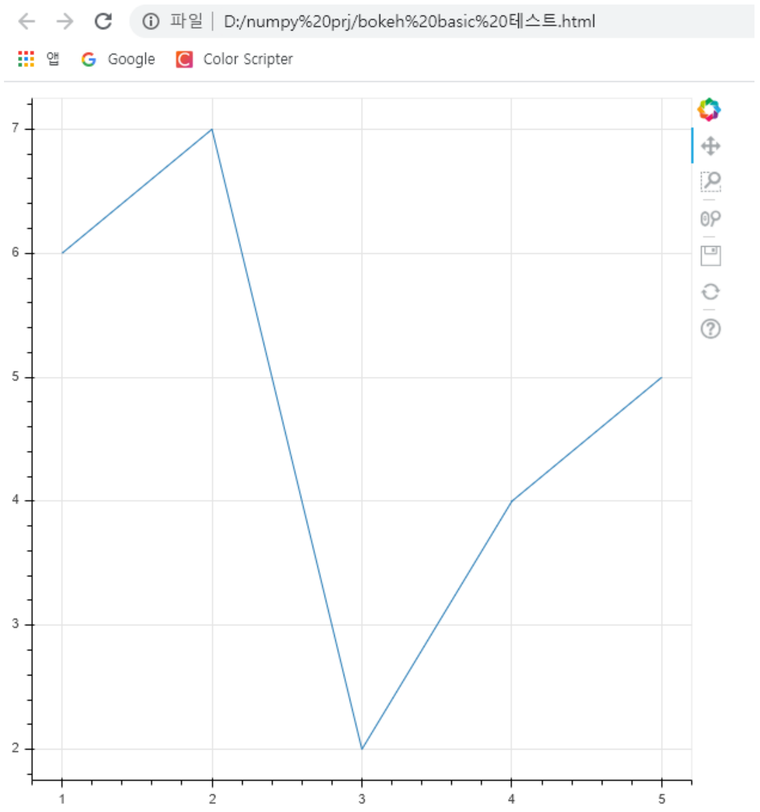


```python
from bokeh.plotting import figure, show

# from bokeh.plotting import output_file
# 출력파일 지정, 없으면 소스파일과 동일한 html 파일로 생성
# output_file("line.html")

p = figure()
# p = figure(plot_width=400, plot_height=400)

# add a line renderer
p.line([1, 2, 3, 4, 5], [6, 7, 2, 4, 5])
# p.line([1, 2, 3, 4, 5], [6, 7, 2, 4, 5], line_width=2)

show(p)
```

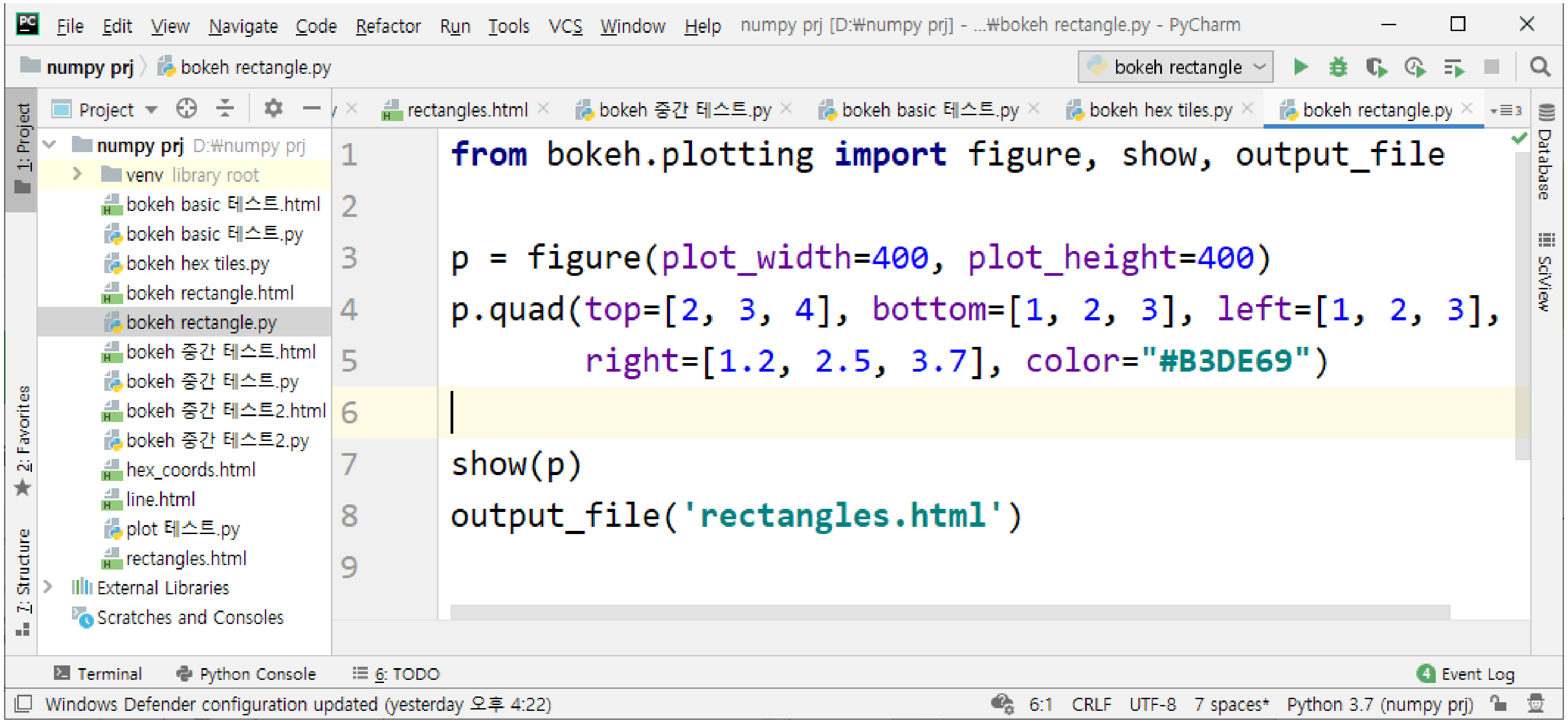
Bokeh, bksample1.py 이해

- 소스 파일과 동일한 폴더에 html 파일로 생성

```
from bokeh.plotting import figure, show


p = figure()

# add a line renderer
p.line([1, 2, 3, 4, 5], [6, 7, 2, 4, 5])

show(p)
```



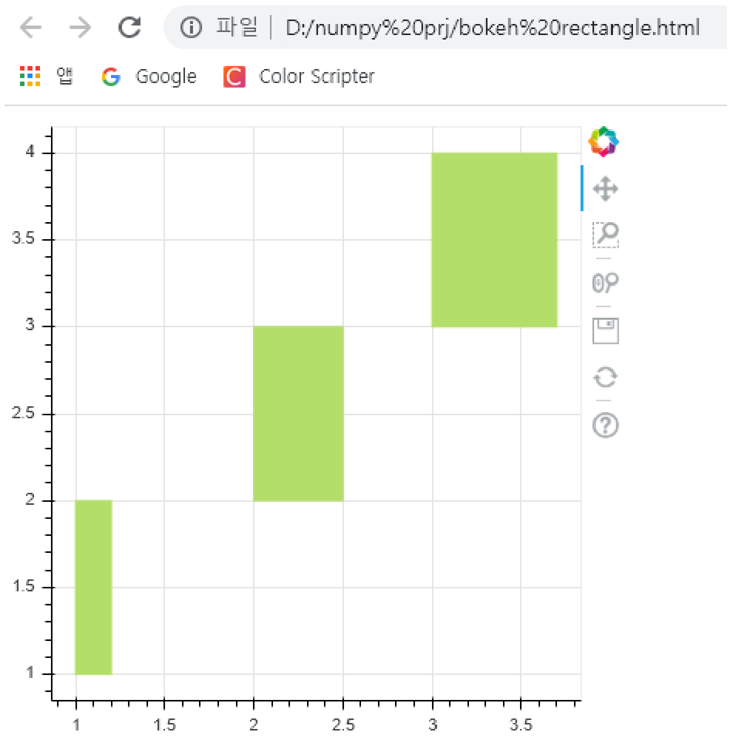
Bokeh, bksample2.py



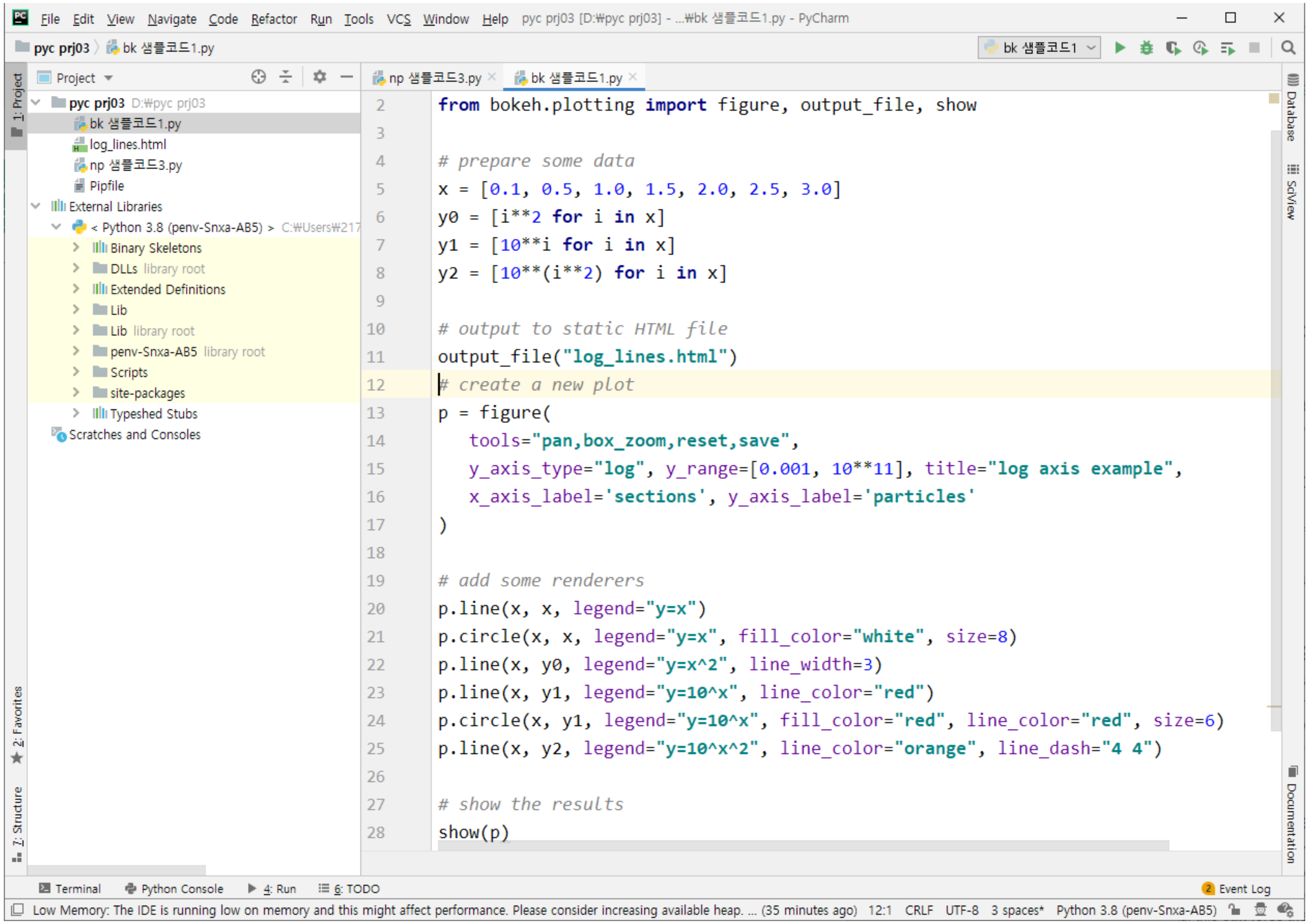
```python
from bokeh.plotting import figure, show, output_file

p = figure(plot_width=400, plot_height=400)
p.quad(top=[2, 3, 4], bottom=[1, 2, 3], left=[1, 2, 3],
       right=[1.2, 2.5, 3.7], color="#B3DE69")

show(p)
output_file('rectangles.html')

```

Bokeh, bksample2.py 이해

```
from bokeh.plotting import figure, show, output_file

p = figure(plot_width=400, plot_height=400)
p.quad(top=[2, 3, 4], bottom=[1, 2, 3], left=[1, 2, 3],
       right=[1.2, 2.5, 3.7], color="#B3DE69")

show(p)
output_file('rectangles.html')
```



Bokeh, bksample3.py

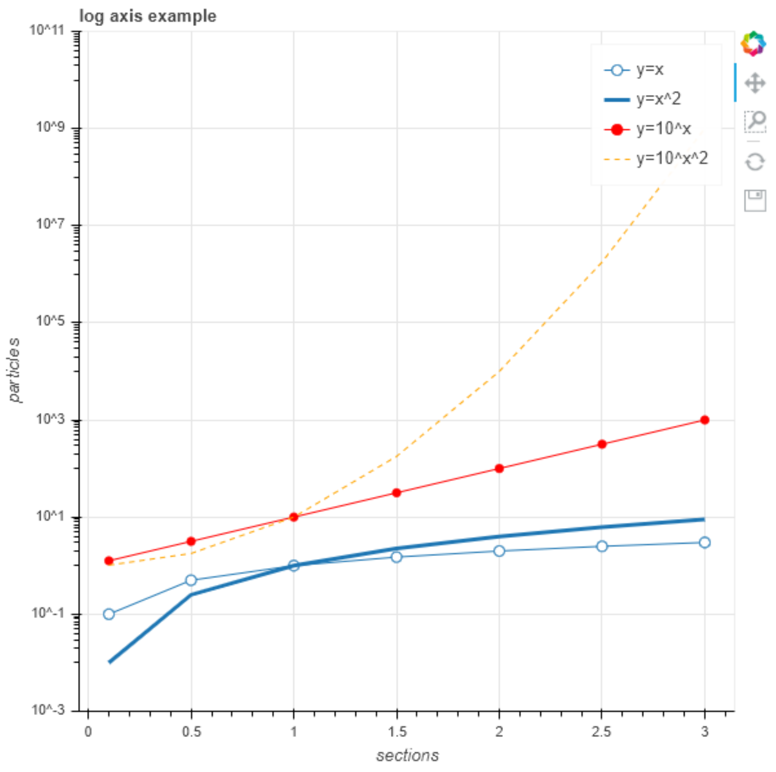

File Edit View Navigate Code Refactor Run Tools VCS Window Help pyc prj03 [D:₩pyc prj03] - ...₩bk 샘플코드1.py - PyCharm
pyc prj03 bk 샘플코드1.py
Project
pyc prj03 D:₩pyc prj03
bk 샘플코드1.py
log_lines.html
np 샘플코드3.py
Pipfile
External Libraries
< Python 3.8 (penv-Snxa-AB5) > C:₩Users₩217
Binary Skeletons
DLLs library root
Extended Definitions
Lib
Lib library root
penv-Snxa-AB5 library root
Scripts
site-packages
Typeshed Stubs
Scratches and Consoles
np 샘플코드3.py
bk 샘플코드1.py
Terminal Python Console 4: Run 6: TODO Event Log

```
from bokeh.plotting import figure, output_file, show

# prepare some data
x = [0.1, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0]
y0 = [i**2 for i in x]
y1 = [10**i for i in x]
y2 = [10**(i**2) for i in x]

# output to static HTML file
output_file("log_lines.html")
# create a new plot
p = figure(
   tools="pan,box_zoom,reset,save",
   y_axis_type="log", y_range=[0.001, 10**11], title="log axis example",
   x_axis_label='sections', y_axis_label='particles'
)

# add some renderers
p.line(x, x, legend="y=x")
p.circle(x, x, legend="y=x", fill_color="white", size=8)
p.line(x, y0, legend="y=x^2", line_width=3)
p.line(x, y1, legend="y=10^x", line_color="red")
p.circle(x, y1, legend="y=10^x", fill_color="red", line_color="red", size=6)
p.line(x, y2, legend="y=10^x^2", line_color="orange", line_dash="4 4")

# show the results
show(p)
```

Low Memory: The IDE is running low on memory and this might affect performance. Please consider increasing available heap. ... (35 minutes ago) 12:1 CRLF UTF-8 3 spaces* Python 3.8 (penv-Snxa-AB5)

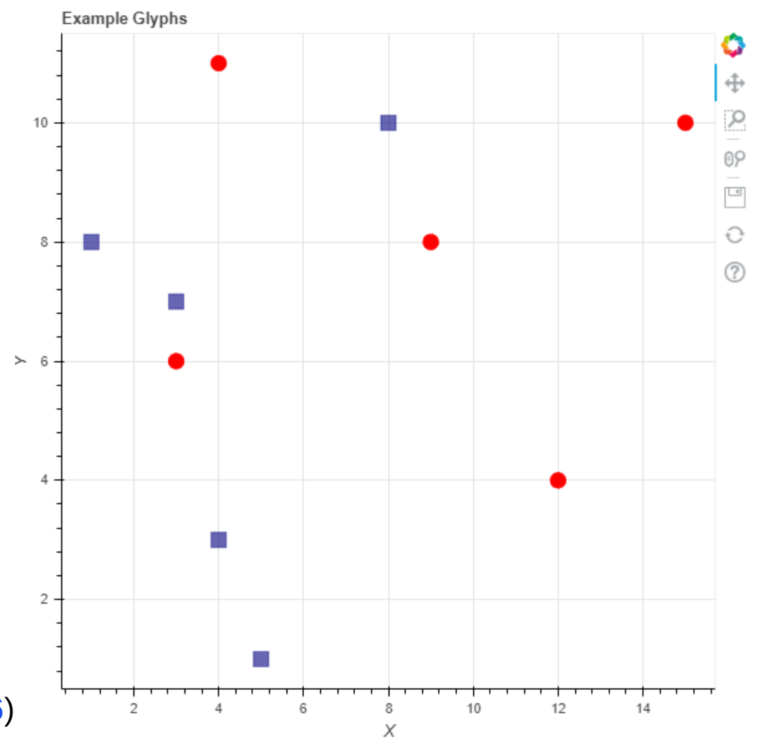
Bokeh, bksample3.py 이해

```
# https://docs.bokeh.org/en/latest/docs/user_guide/quickstart.html#userguide-quickstart
from bokeh.plotting import figure, output_file, show

# prepare some data
x = [0.1, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0]
y0 = [i**2 for i in x]
y1 = [10**i for i in x]
y2 = [10**(i**2) for i in x]

# output to static HTML file
output_file("log_lines.html")

# create a new plot
p = figure(
   tools="pan,box_zoom,reset,save",
   y_axis_type="log", y_range=[0.001, 10**11],
   title="log axis example",
   x_axis_label='sections', y_axis_label='particles'
)

# add some renderers
p.line(x, x, legend="y=x")
p.circle(x, x, legend="y=x", fill_color="white", size=8)
p.line(x, y0, legend="y=x^2", line_width=3)
p.line(x, y1, legend="y=10^x", line_color="red")
p.circle(x, y1, legend="y=10^x", fill_color="red", line_color="red", size=6)
p.line(x, y2, legend="y=10^x^2", line_color="orange", line_dash="4 4")

# show the results
show(p)
```

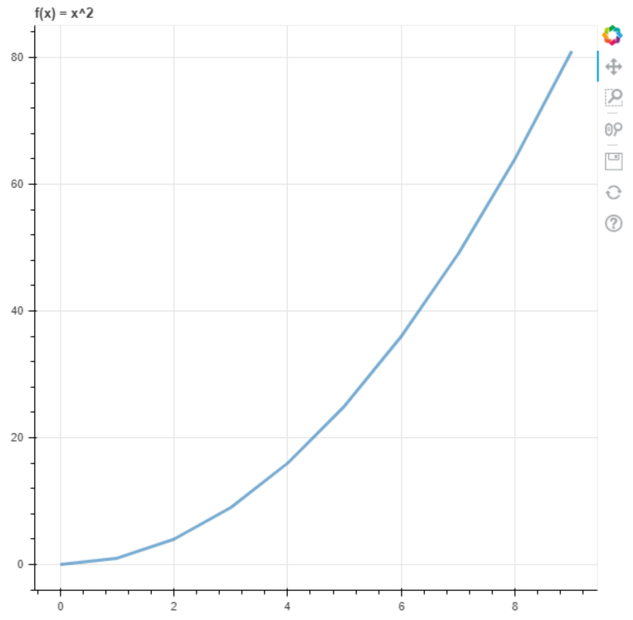


Bokeh, bksample4.py 이해

```
# bokeh basics
from bokeh.plotting import figure
from bokeh.io import show
# from bokeh.io import show, output_notebook

# Create a blank figure with labels
p = figure(plot_width = 600, plot_height = 600,
           title = 'Example Glyphs',
           x_axis_label = 'X', y_axis_label = 'Y')

# Example data
squares_x = [1, 3, 4, 5, 8]
squares_y = [8, 7, 3, 1, 10]
circles_x = [9, 12, 4, 3, 15]
circles_y = [8, 4, 11, 6, 10]

# Add squares glyph
p.square(squares_x, squares_y, size = 12, color = 'navy', alpha = 0.6)
# Add circle glyph
p.circle(circles_x, circles_y, size = 12, color = 'red')

# Set to output the plot in the notebook
# output_notebook()
# Show the plot
show(p)
```



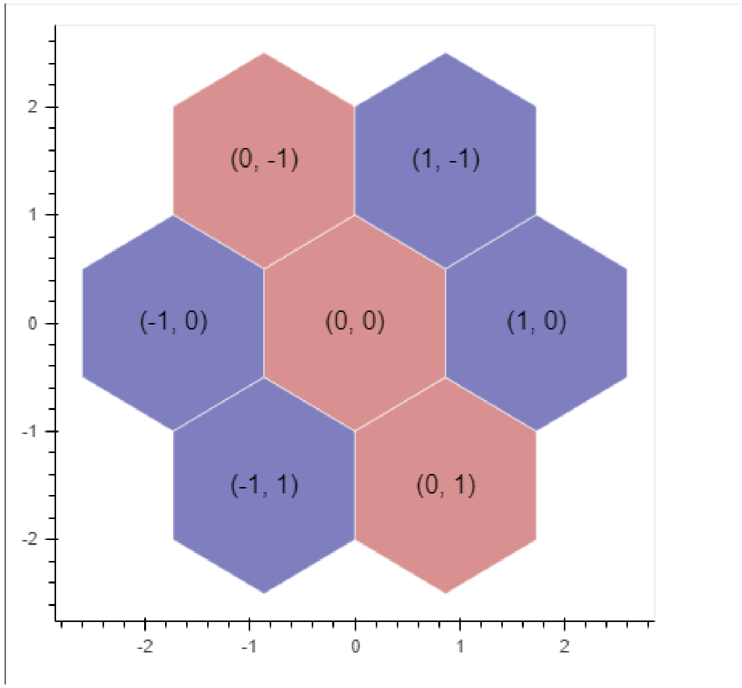
Bokeh, bksample5.py 이해



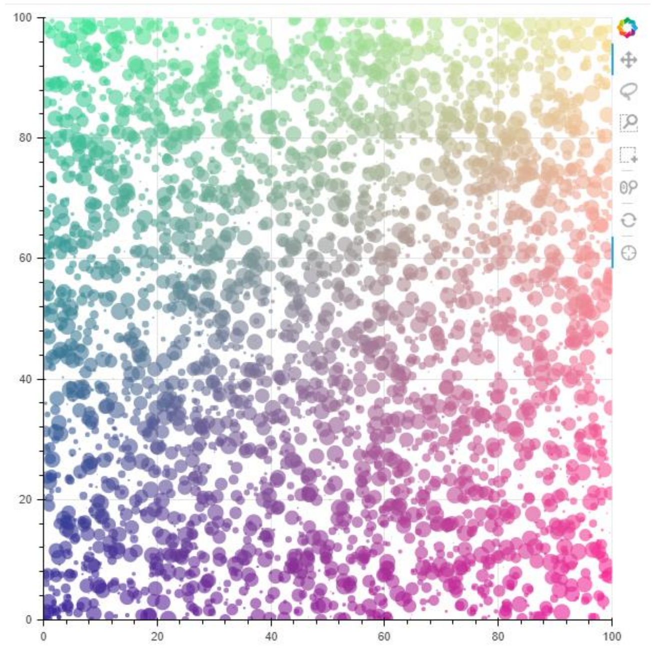
```
from bokeh.io import show
from bokeh.plotting import figure
from bokeh.models import ColumnDataSource

x_values = range(10)
y_values = [x ** 2 for x in x_values]
data_source = ColumnDataSource(data=dict(x=x_values, y=y_values))

plot = figure(title = 'f(x) = x^2')
plot.line('x', 'y', source = data_source, line_width=3, line_alpha=0.6)
show(plot)
```

Bokeh, bksample6.py 이해

```
import numpy as np

from bokeh.io import output_file, show
from bokeh.plotting import figure
from bokeh.util.hex import axial_to_cartesian

output_file("hex_coords.html")

q = np.array([0,  0, 0, -1, -1,  1, 1])
r = np.array([0, -1, 1,  0,  1, -1, 0])

p = figure(plot_width=400, plot_height=400, toolbar_location=None)
p.grid.visible = False

p.hex_tile(q, r, size=1, fill_color=["firebrick"]*3 + ["navy"]*4,
           line_color="white", alpha=0.5)

x, y = axial_to_cartesian(q, r, 1, "pointytop")

p.text(x, y, text=["(%d, %d)" % (q,r) for (q, r) in zip(q, r)],
       text_baseline="middle", text_align="center")

show(p)
```



Bokeh, bksample7.py 이해



```
import numpy as np

from bokeh.plotting import figure, output_file, show

# prepare some data
N = 4000
x = np.random.random(size=N) * 100
y = np.random.random(size=N) * 100
radii = np.random.random(size=N) * 1.5
colors = [
    "#%02x%02x%02x" % (int(r), int(g), 150) for r, g in zip(50+2*x, 30+2*y)
]

# output to static HTML file (with CDN resources)
output_file("color_scatter.html", title="color_scatter.py example", mode="cdn")

TOOLS = "crosshair,pan,wheel_zoom,box_zoom,reset,box_select,lasso_select"

# create a new plot with the tools above, and explicit ranges
p = figure(tools=TOOLS, x_range=(0, 100), y_range=(0, 100))

# add a circle renderer with vectorized colors and sizes
p.circle(x, y, radius=radii, fill_color=colors, fill_alpha=0.6, line_color=None)

# show the results
show(p)
```