Python for Data Science

Matplotlib - Part 3

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Plot Appearance

In [ ]:

In [ ]:

matplotlib | pyplot — Matplotlib 1.5.

localhost:8888/notebooks/Python-Data-Science-and-Machine-Learning-Bootcamp-master/Python-Data-Science-and-Machine-Learning-Bootcamp-master/Python-for-Data-Visualization/Matplotlib/matplotlib.ipynb

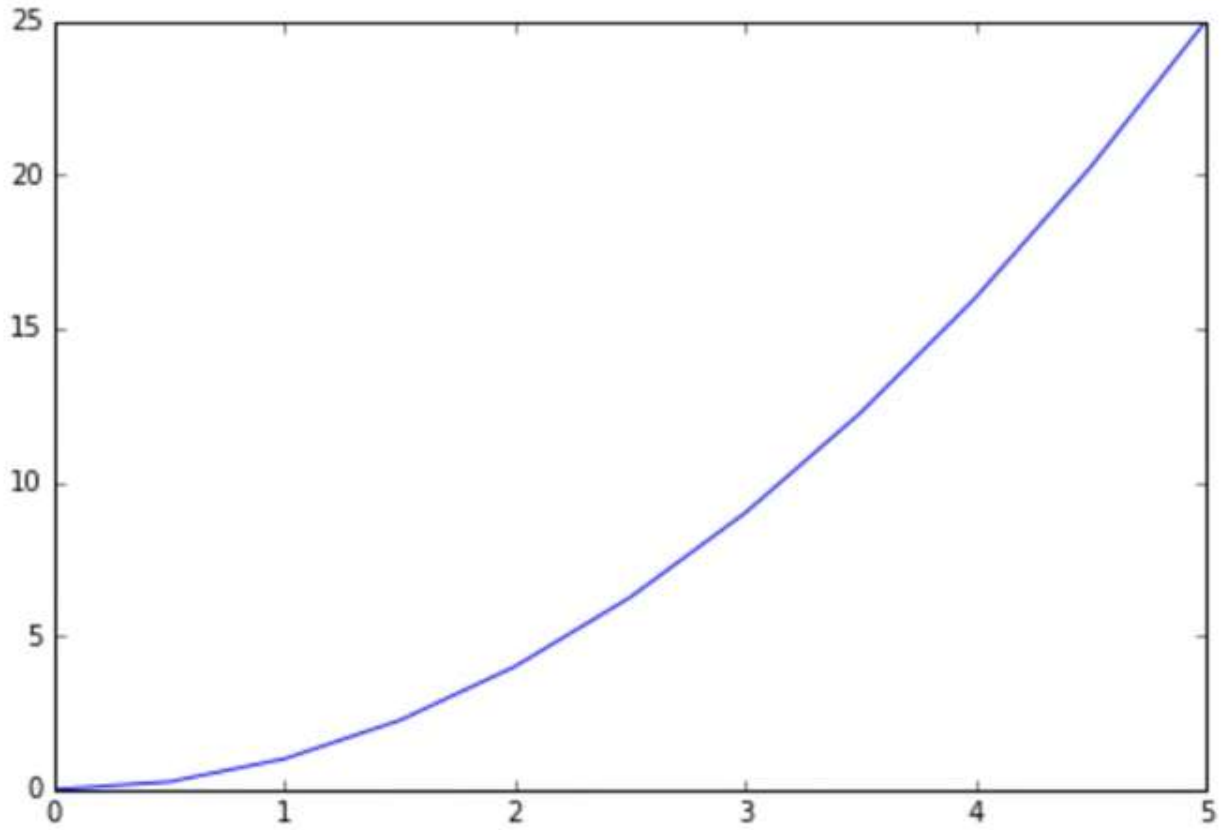
File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

In [66]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y)
```

Out[66]:
```
[<matplotlib.lines.Line2D at 0x164b1a71208>]
```



matplotlib

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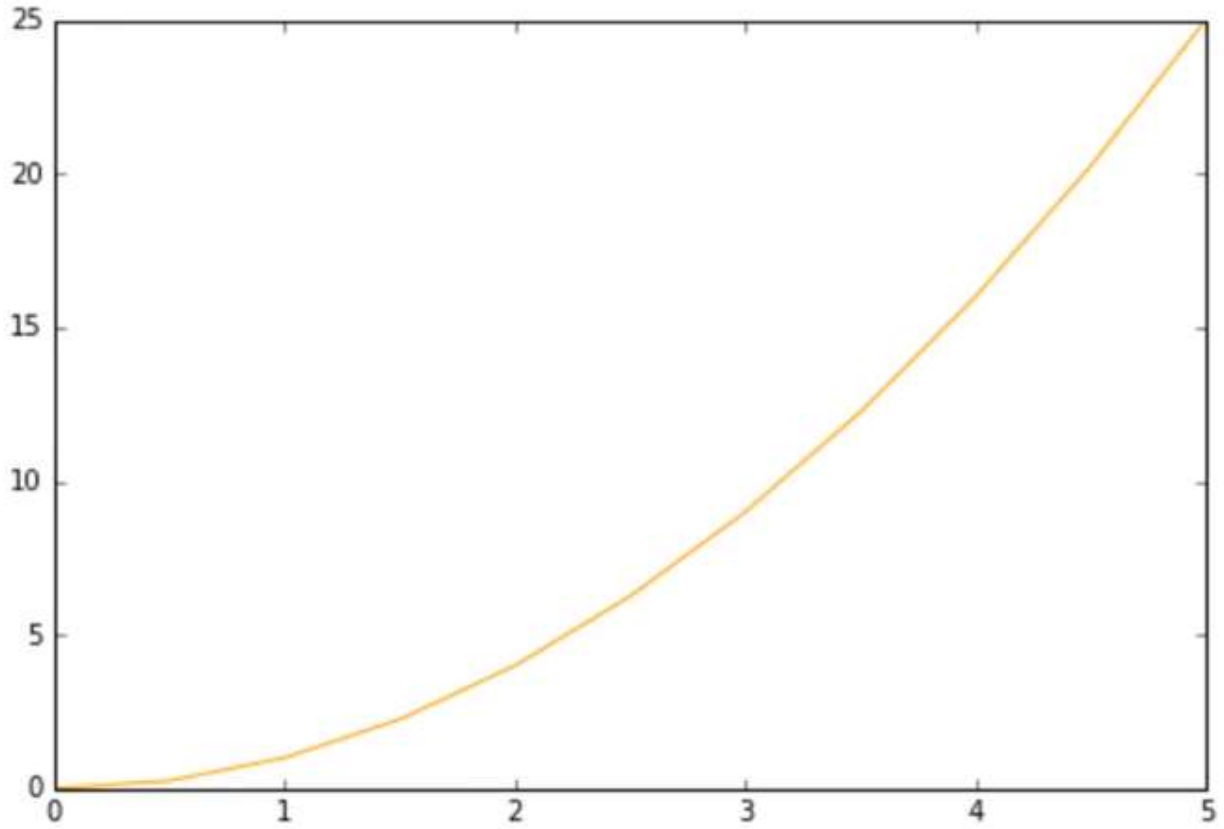
File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

In [67]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='orange')
```

Out[67]:
```
[<matplotlib.lines.Line2D at 0x164b1a409b0>]
```



matplotlib

pyplot — Matplotlib 1.5.

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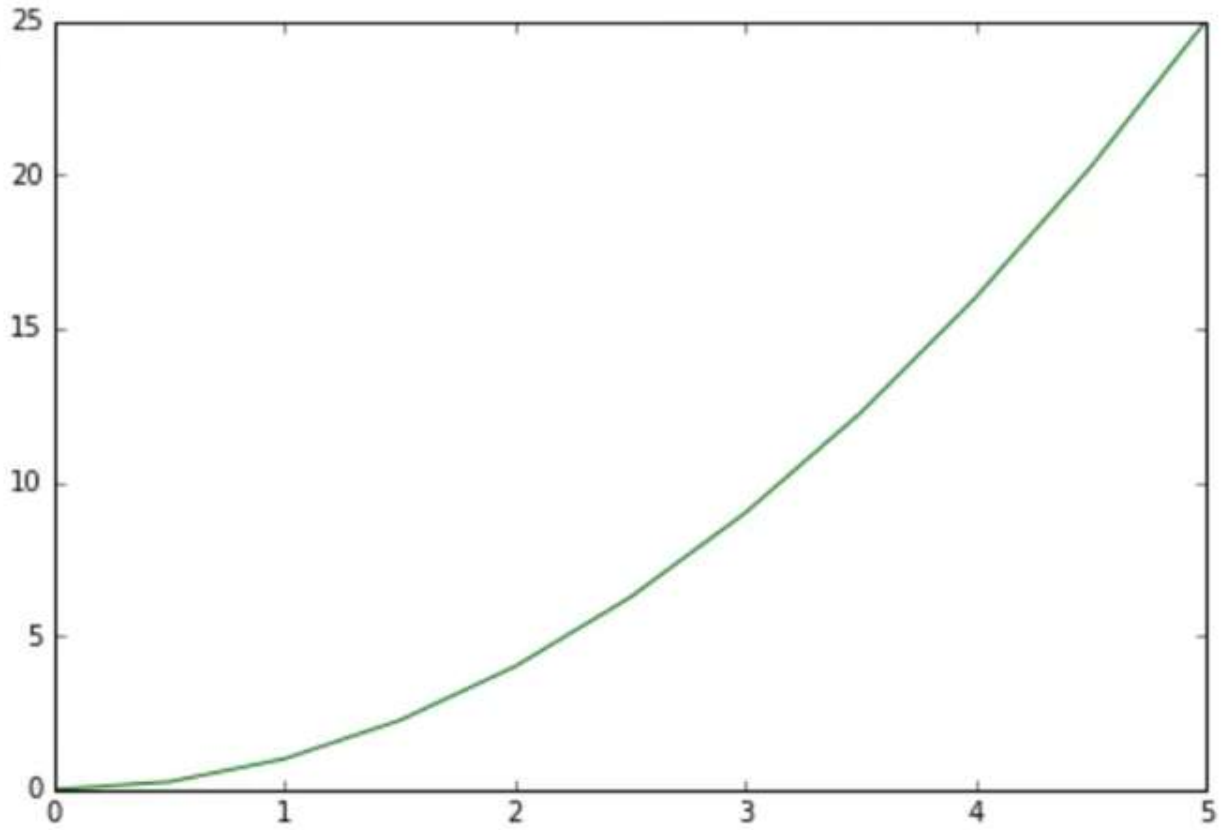
Python [conda env:py35]

In [68]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='green')
```

Out[68]:
```
[<matplotlib.lines.Line2D at 0x164b1a99128>]
```



matplotlib

pyplot — Matplotlib 1.5.

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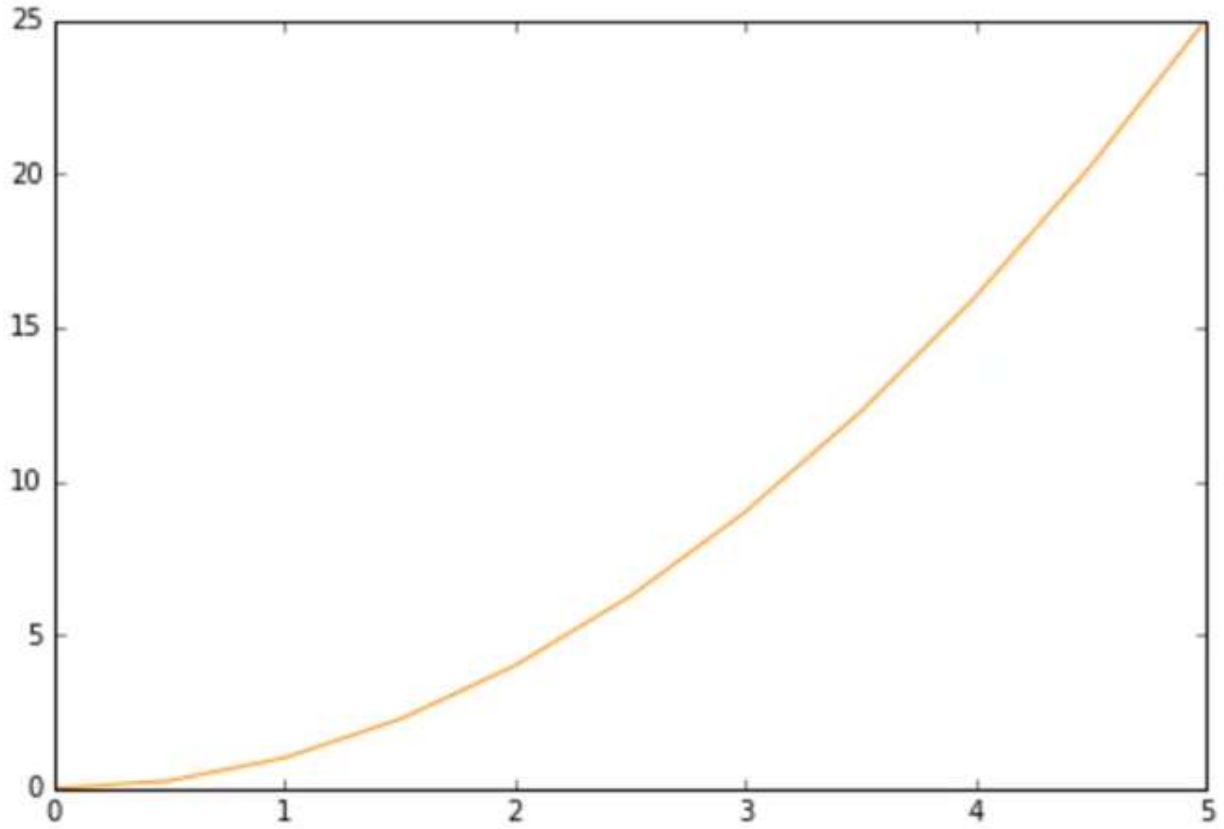
File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

In [69]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='#FF8C00')
```

Out[69]:
```
[<matplotlib.lines.Line2D at 0x164b1afc438>]
```



matplotlib

pyplot — Matplotlib 1.5.

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Python [conda env:py35]

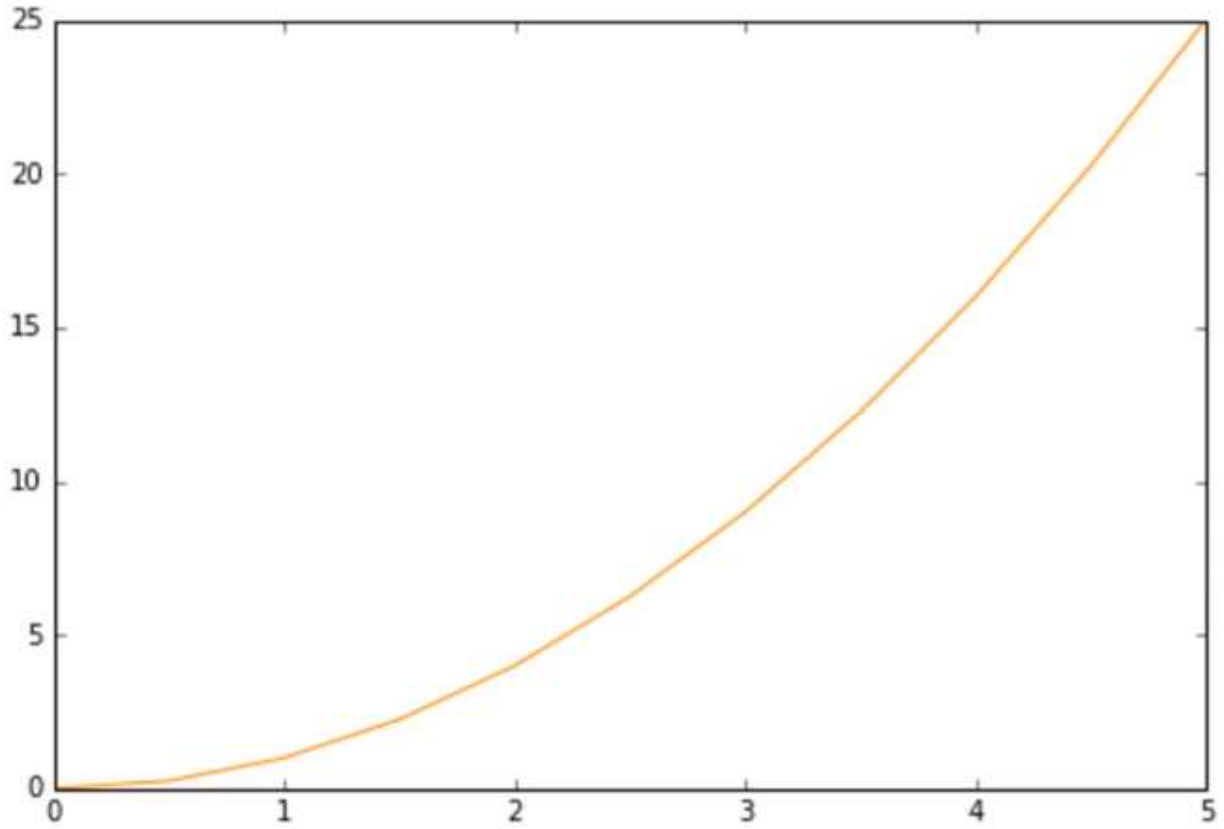
In [69]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='#FF8C00') # RGB Hex Code
```

Google it.

Out[69]: [<matplotlib.lines.Line2D at 0x164b1afc438>]



matplotlib | pyplot — Matplotlib 1.5.

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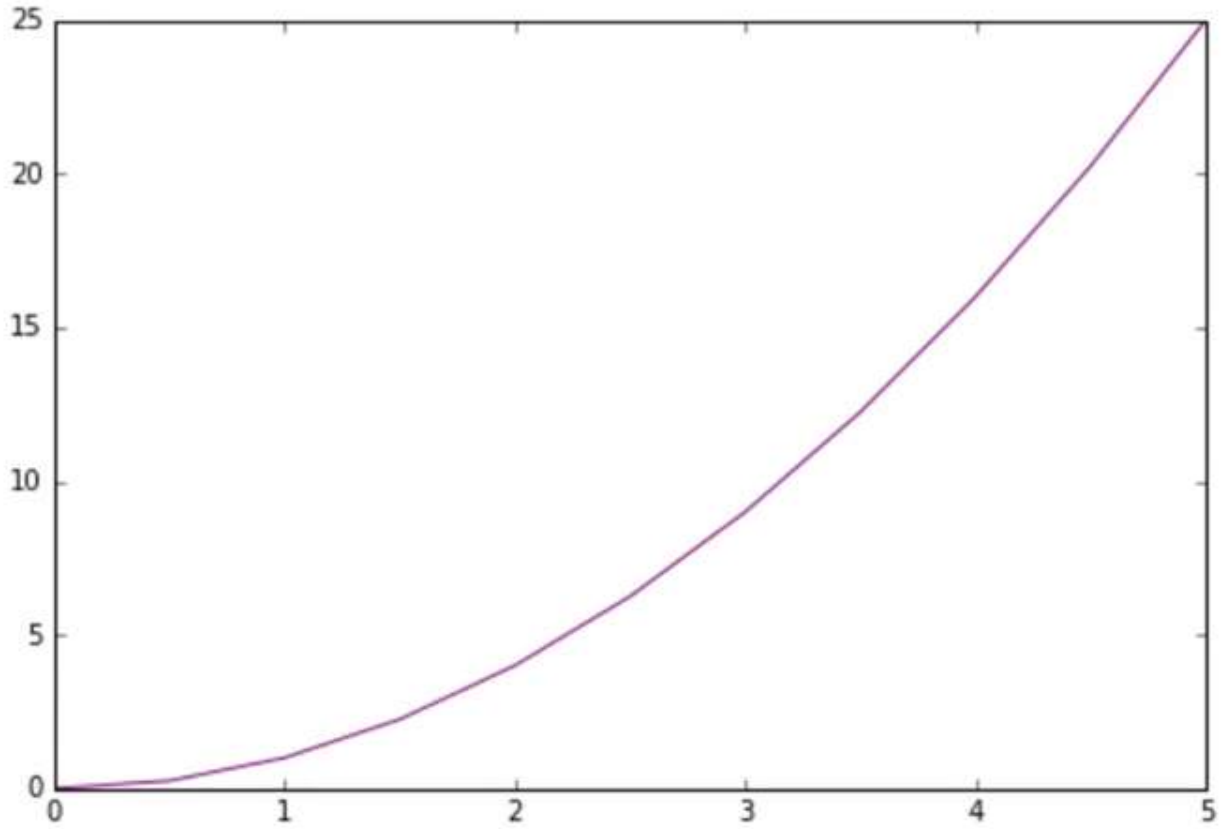
File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

In [71]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',linewidth=1) # RGB Hex Code
```

Out[71]:
```
[<matplotlib.lines.Line2D at 0x164b1bb7390>]
```



matplotlib | pyplot — Matplotlib 1.5.

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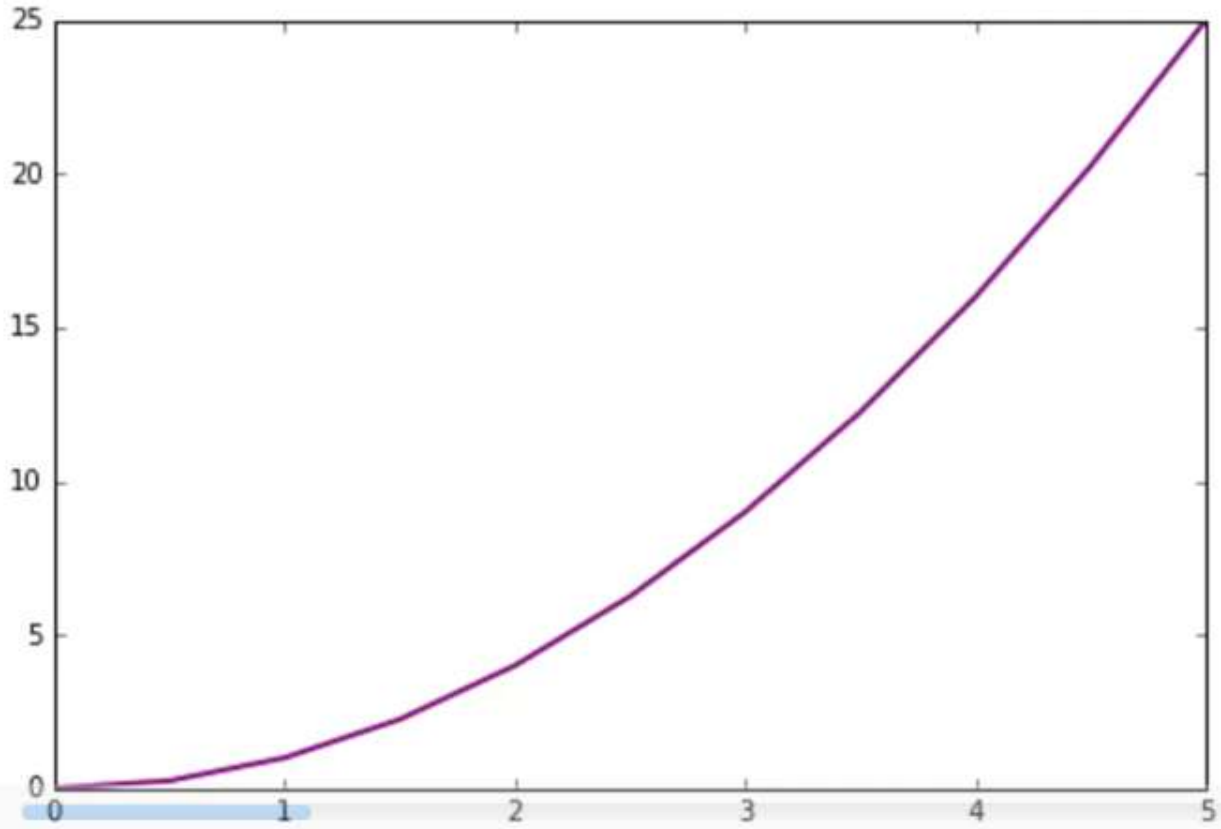
In [72]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',linewidth=2) # RGB Hex Code
```

Out[72]: [<matplotlib.lines.Line2D at 0x164b1c1df28>]



02:40 -09:12

-09:12/11:52

matplotlib | pyplot — Matplotlib 1.5.

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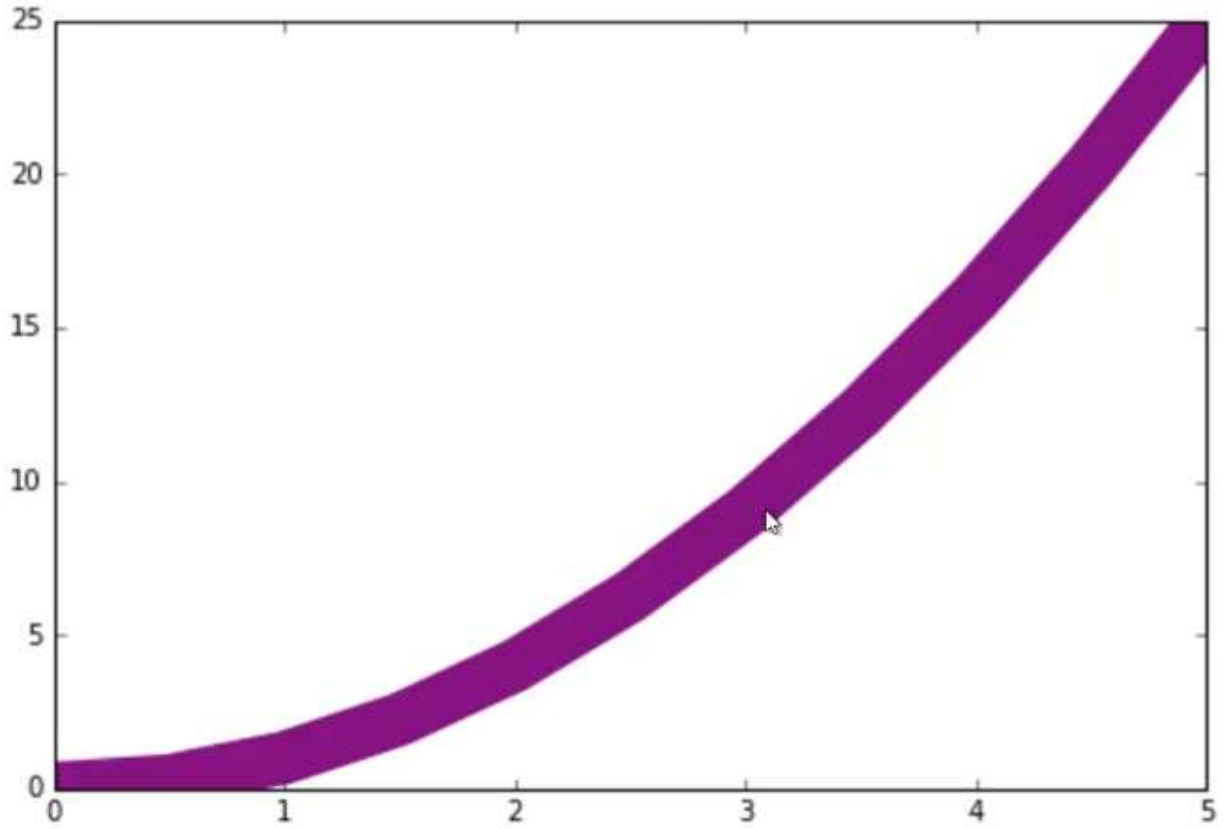
File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

In [73]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',linewidth=20) # RGB Hex Code
```

Out[73]: [<matplotlib.lines.Line2D at 0x164b1c78f60>]



matplotlib | pyplot — Matplotlib 1.5.

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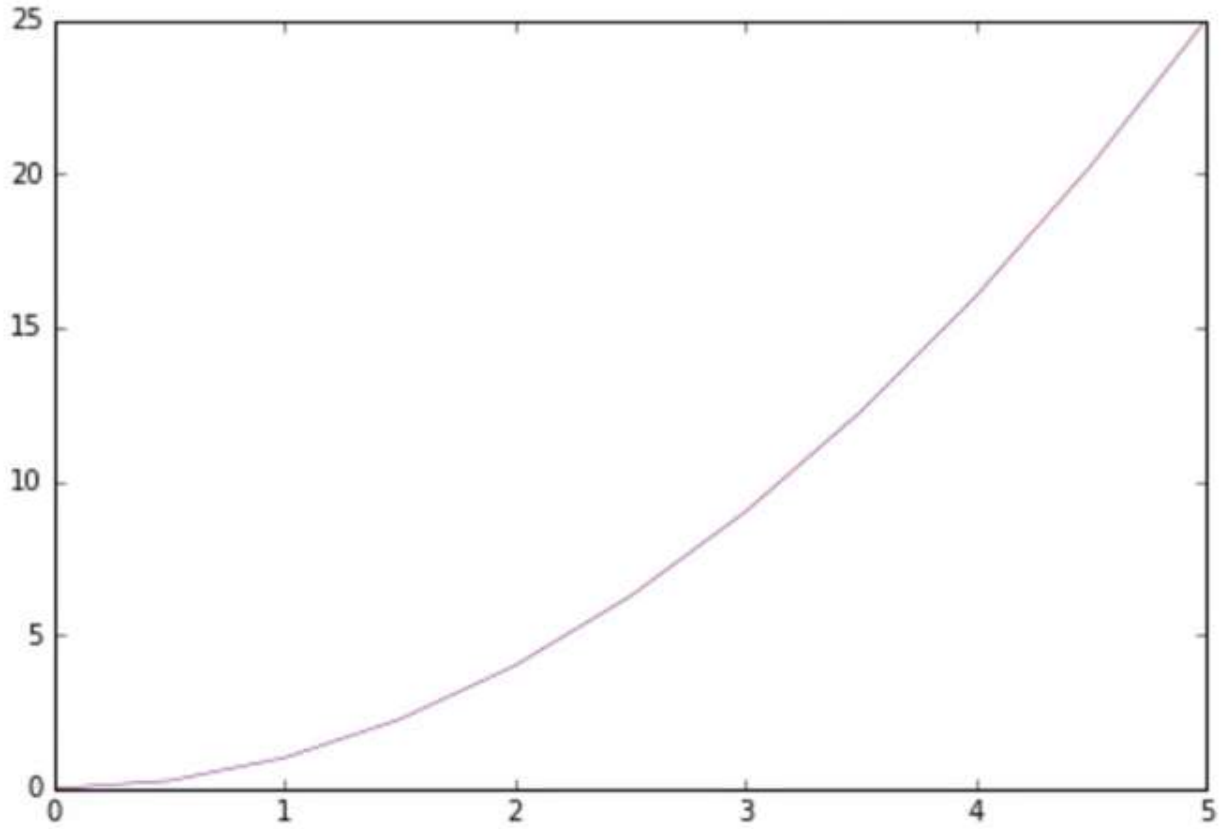
File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

In [74]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',linewidth=0.$) # RGB Hex Code
```

Out[74]:
```
[<matplotlib.lines.Line2D at 0x164b1a80828>]
```



matplotlib | pyplot — Matplotlib 1.5.

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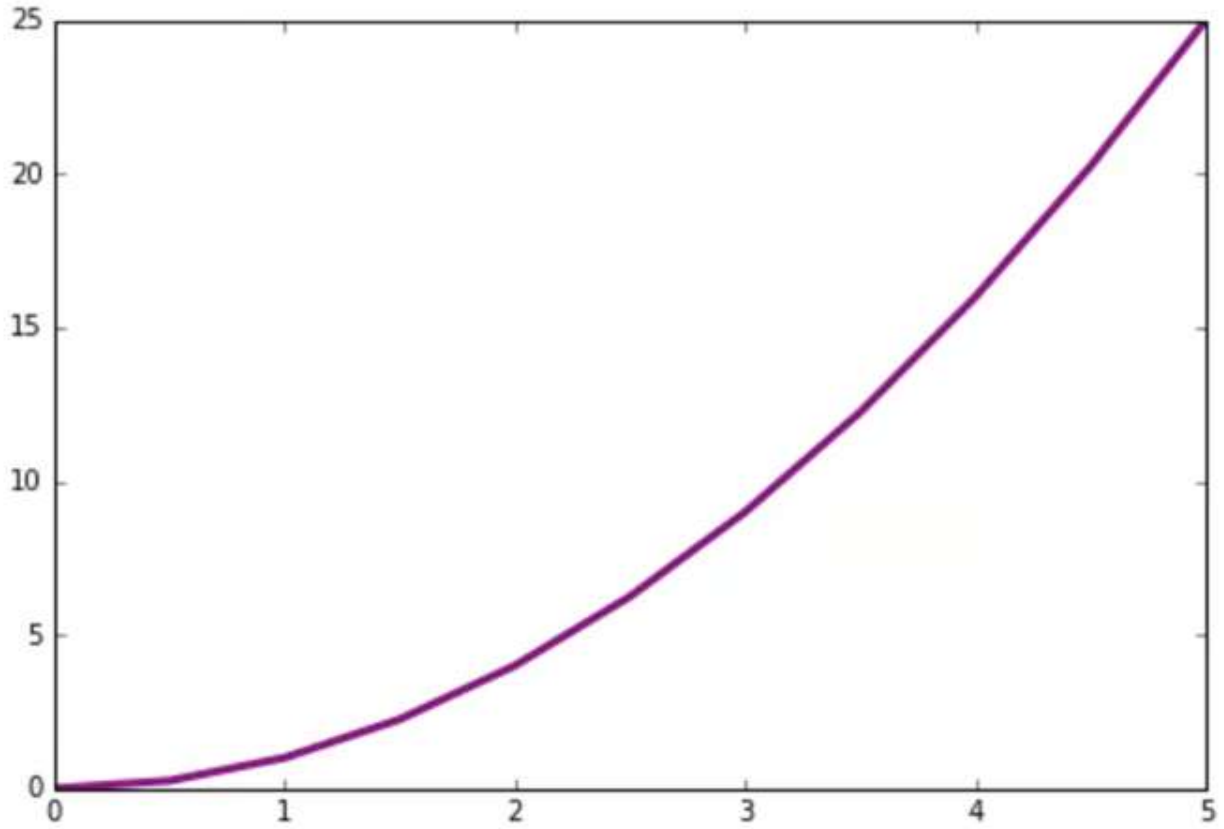
In [75]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',linewidth=3) # RGB Hex Code
```

Out[75]: [<matplotlib.lines.Line2D at 0x164b1c48048>]



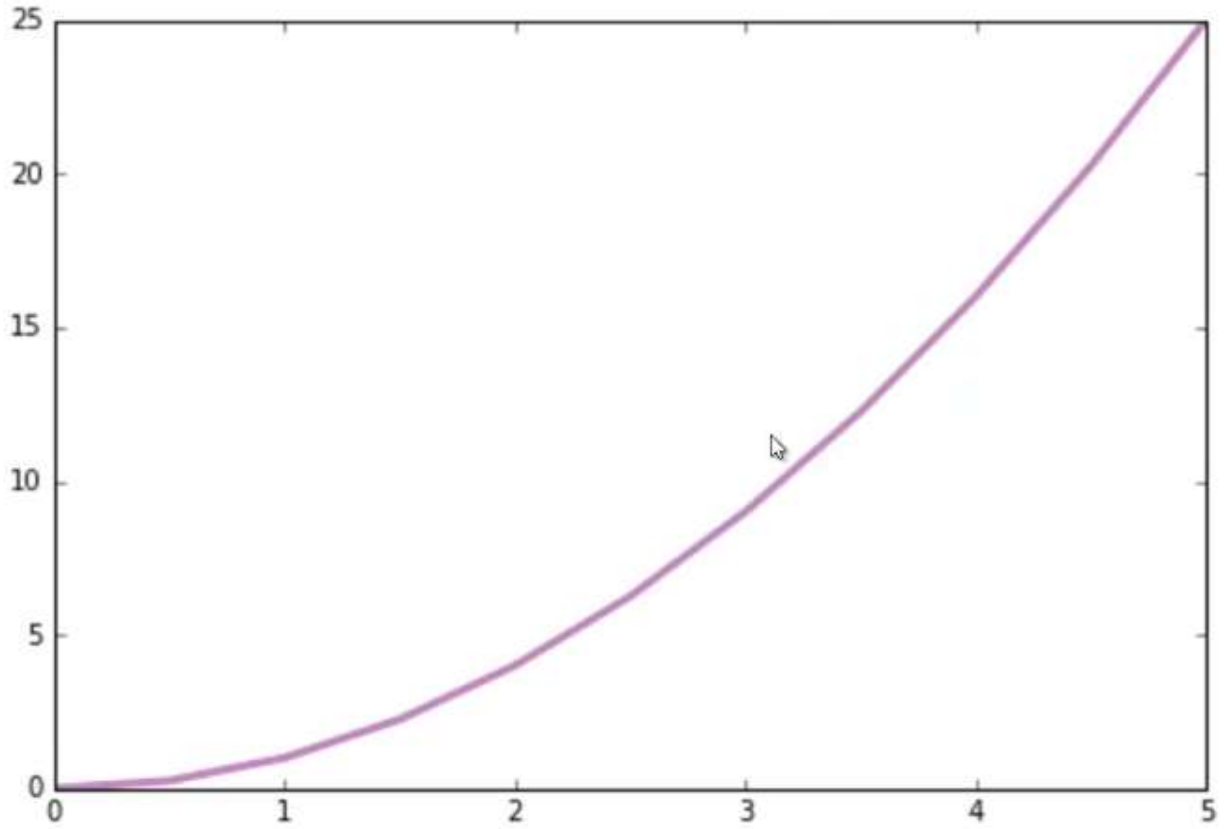
In [76]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',linewidth=3,alpha=0.5) # RGB Hex Code
```

Transparency level

Out[76]:
```
[<matplotlib.lines.Line2D at 0x164b187a940>]
```



matplotlib

pyplot — Matplotlib 1.5.

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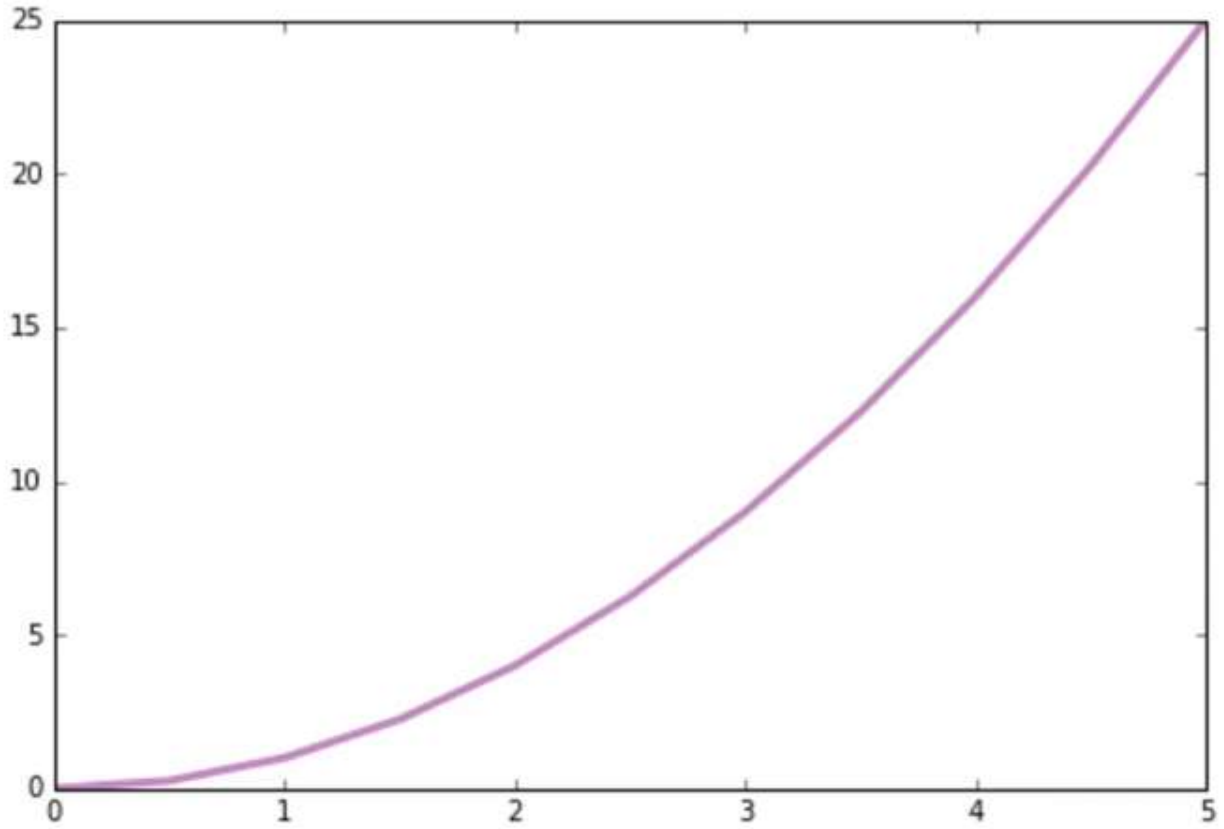
Python [conda env:py35]

In [76]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=3,alpha=0.5)# RGB Hex Code
```

Out[76]:
```
[<matplotlib.lines.Line2D at 0x164b187a940>]
```

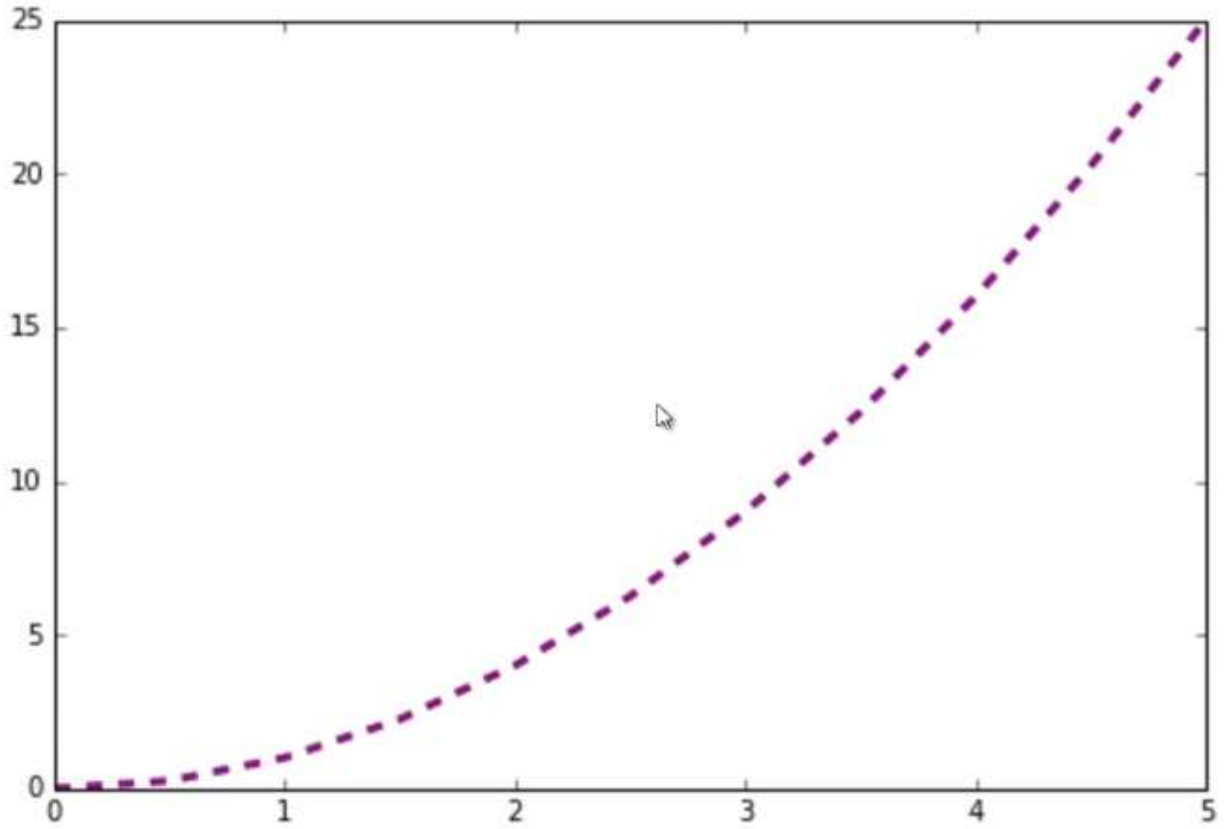


In [78]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=3,linestyle='--')
```

Out[78]:
```
[<matplotlib.lines.Line2D at 0x164b2db6da0>]
```



matplotlib

pyplot — Matplotlib 1.5.

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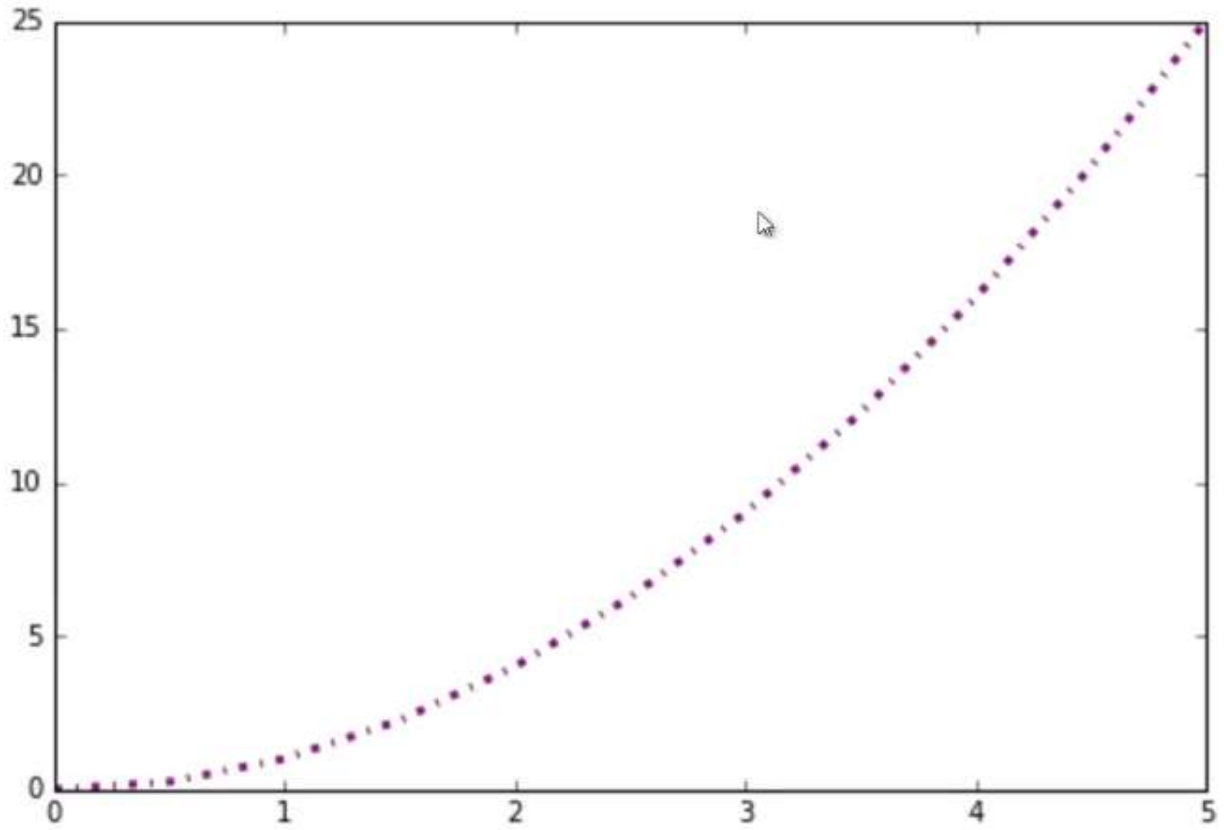
In [79]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=3,linestyle='-.')
```

Out[79]:
```
[<matplotlib.lines.Line2D at 0x164b2e1c940>]
```



matplotlib

pyplot — Matplotlib 1.5.

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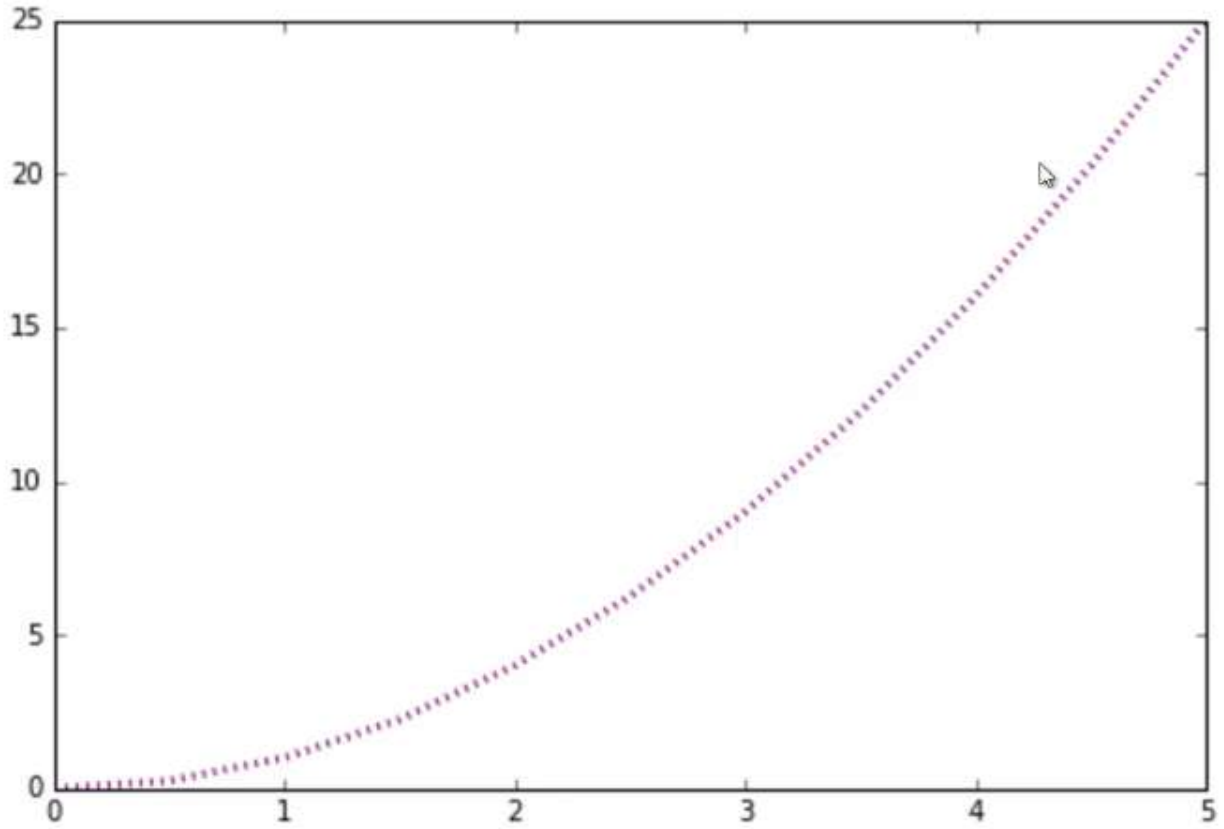
In [80]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=3,linestyle=':')
```

Out[80]:
```
[<matplotlib.lines.Line2D at 0x164b2e7c048>]
```

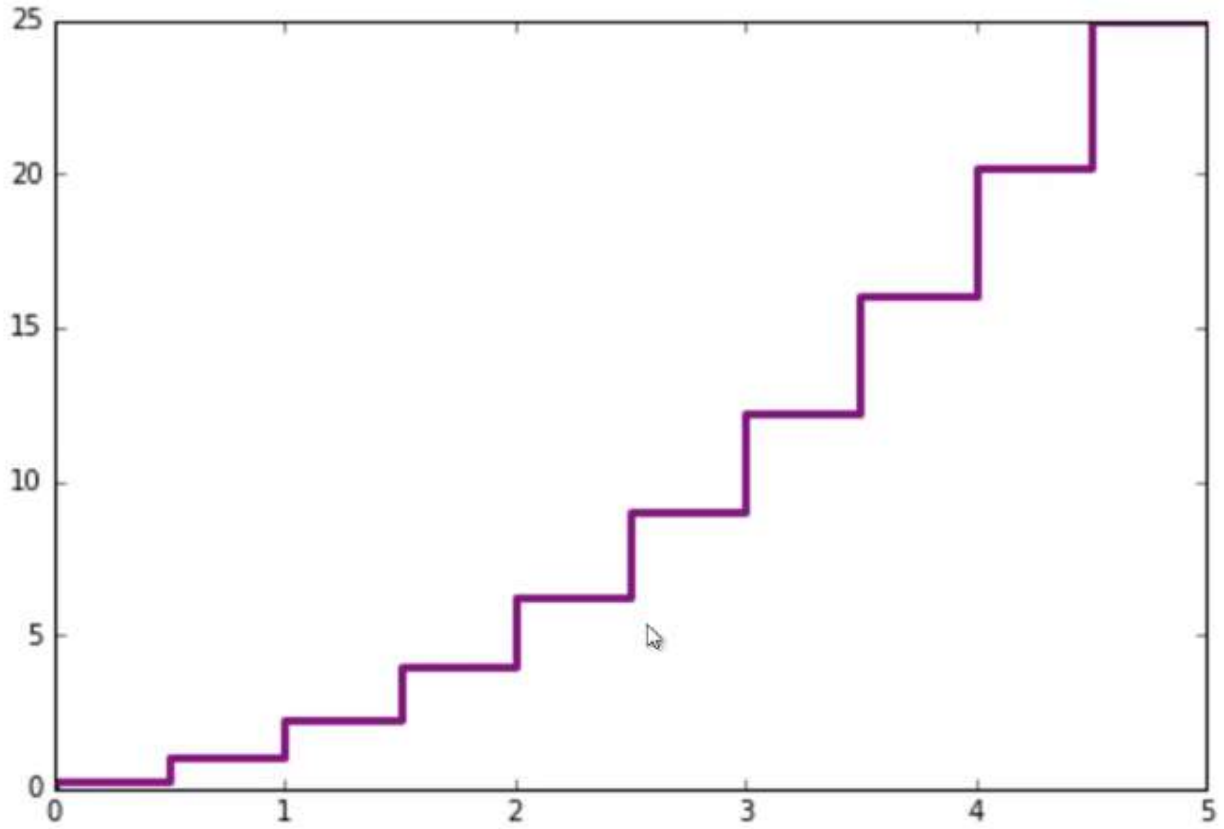


In [81]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=3,linestyle='steps')
```

Out[81]: [<matplotlib.lines.Line2D at 0x164b2ed0e48>]



matplotlib | pyplot — Matplotlib 1.5.

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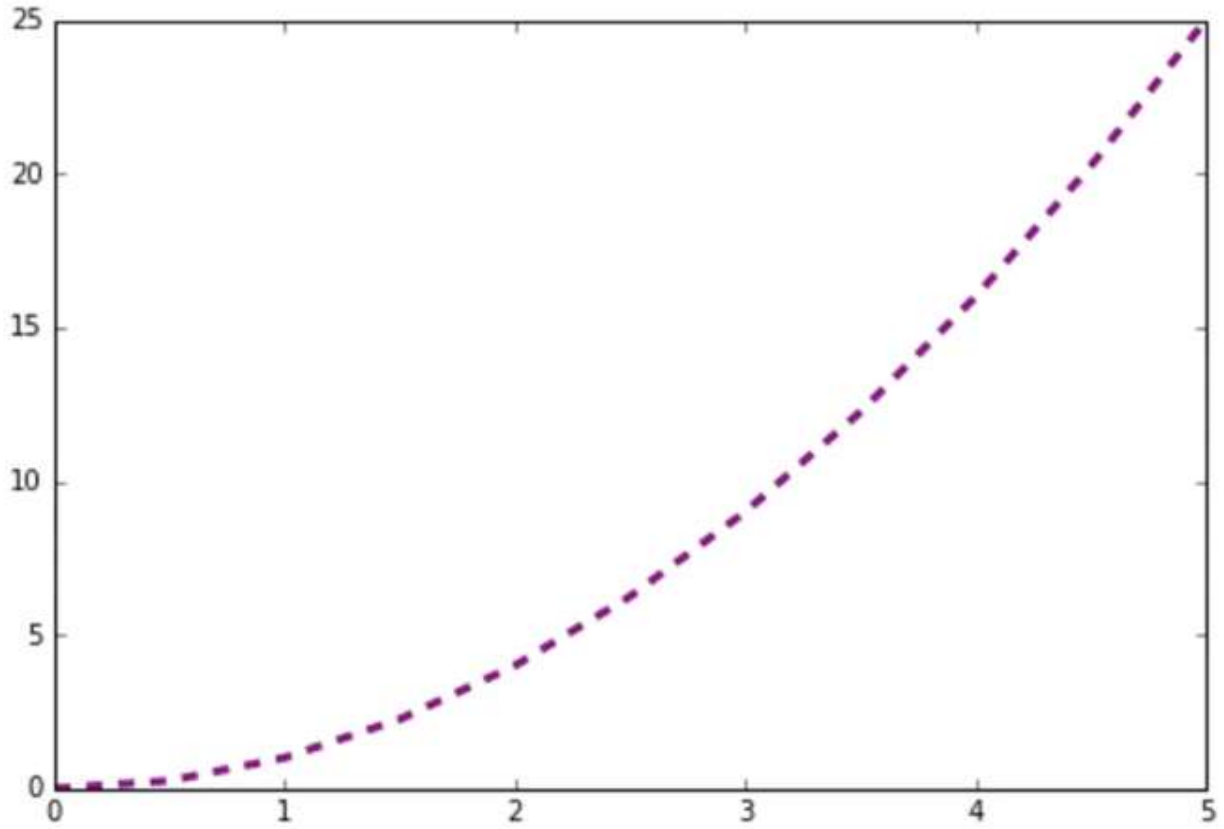
File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

In [84]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=3,ls='--')
```

Out[84]:
```
[<matplotlib.lines.Line2D at 0x164b2fc8860>]
```



matplotlib | pyplot — Matplotlib 1.5.

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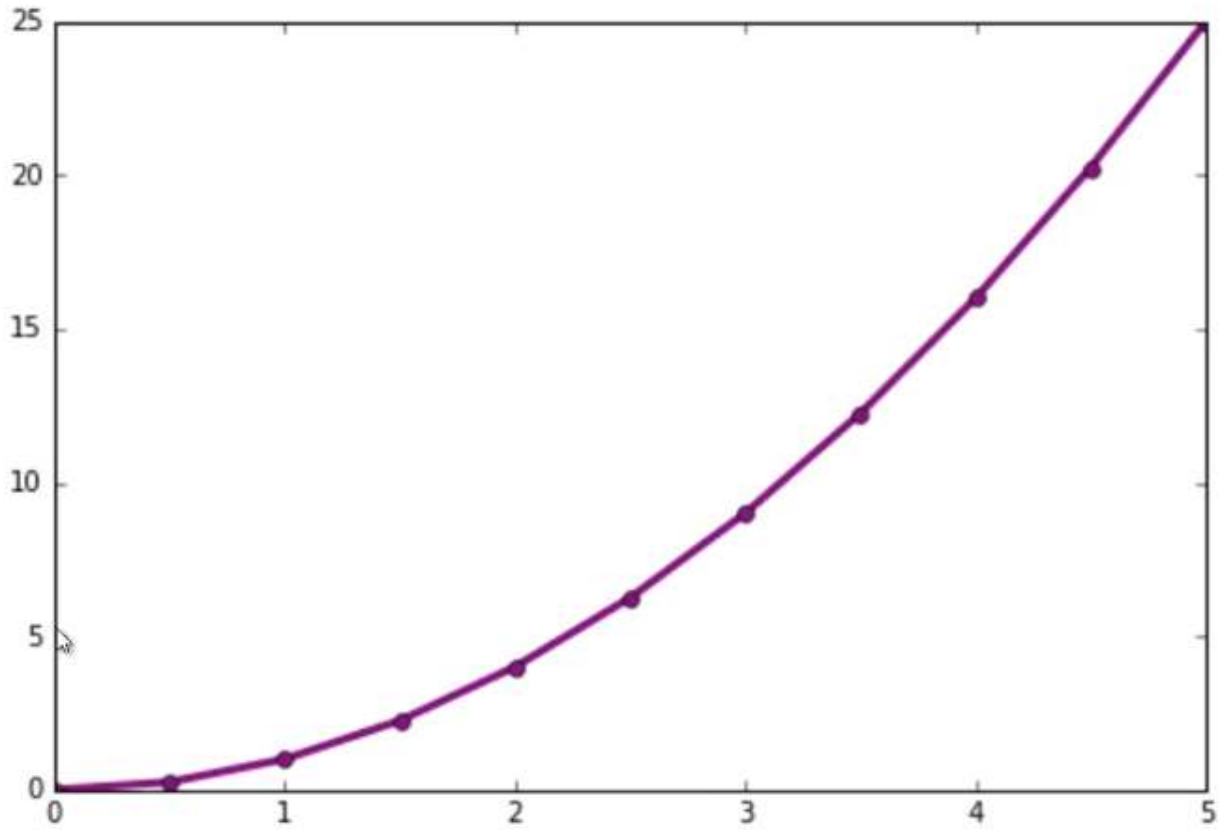
File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

In [88]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=3,ls='-',marker='o')
```

Out[88]: [<matplotlib.lines.Line2D at 0x164b30ad908>]

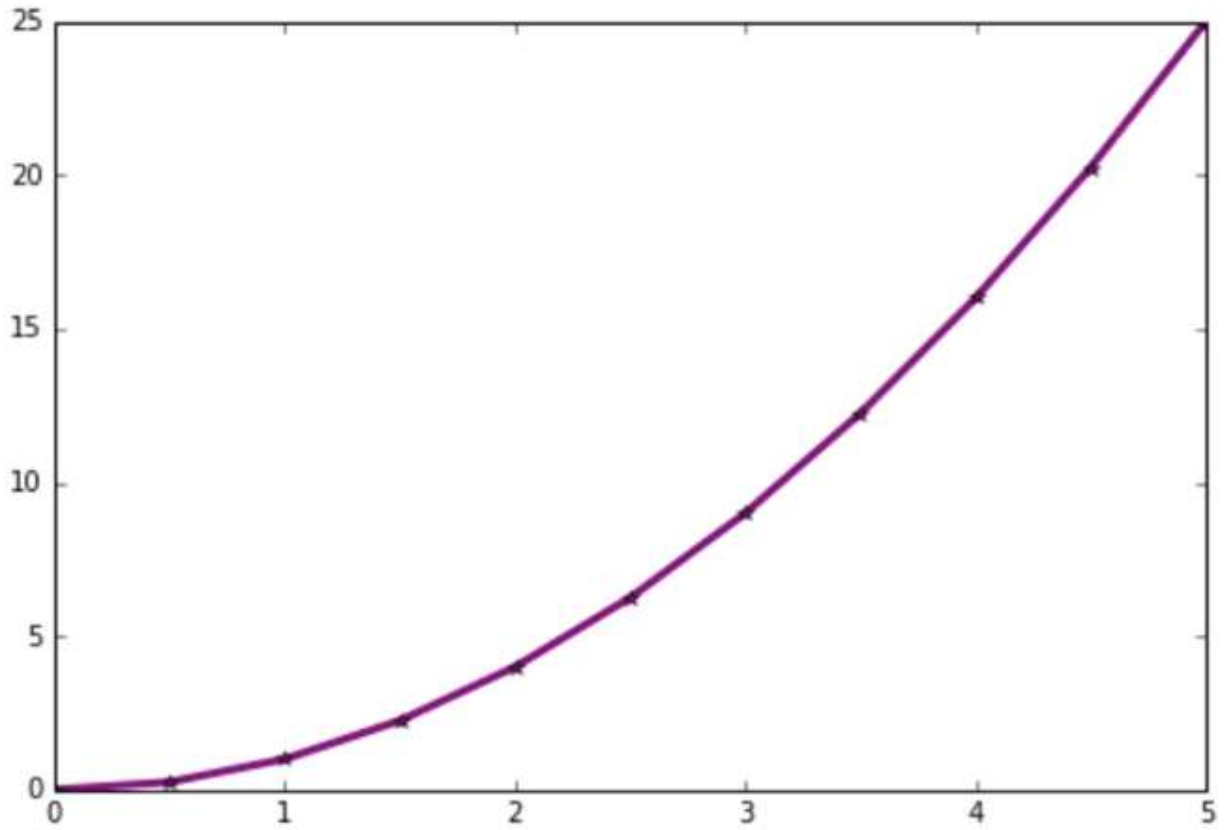


In [90]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=3,ls='-',marker='*')
```

Out[90]: [<matplotlib.lines.Line2D at 0x164b3170358>]



matplotlib | pyplot — Matplotlib 1.5.

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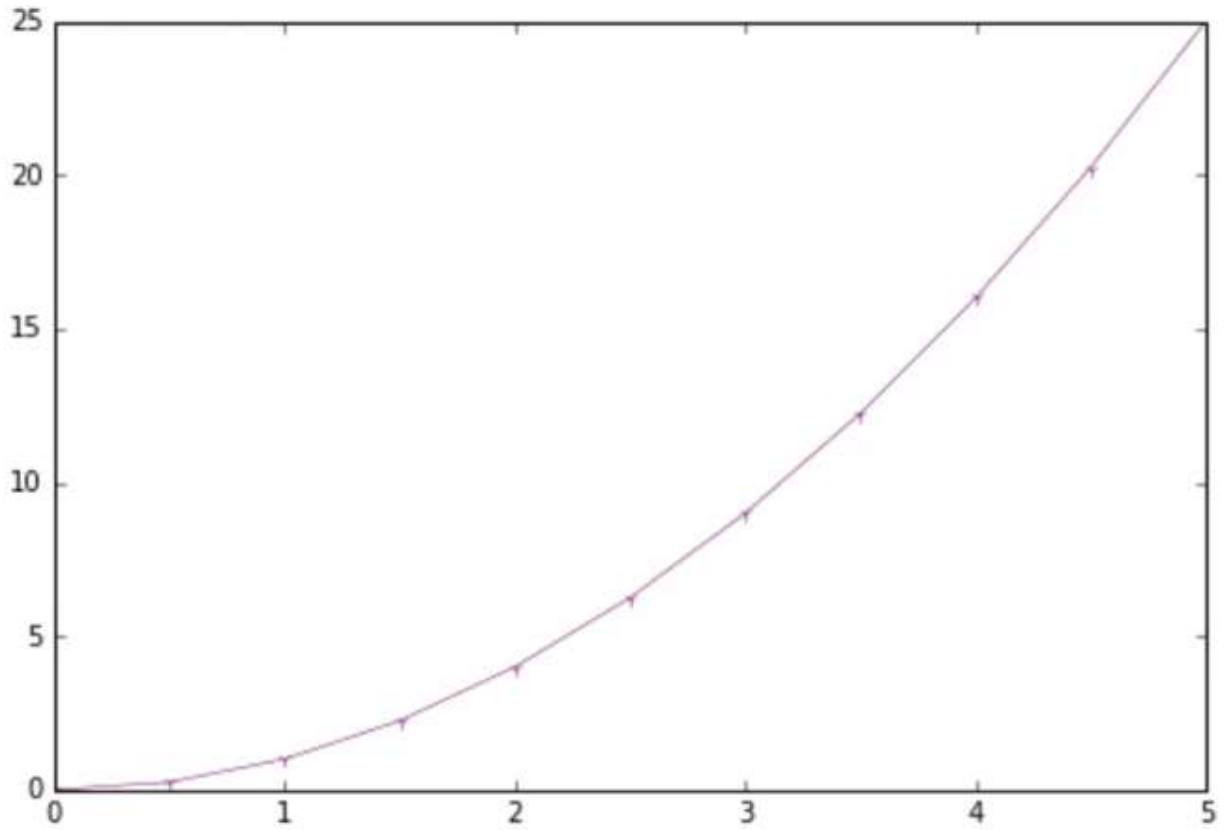
File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

In [92]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=0.5,ls='-',marker='1')
```

Out[92]:
```
[<matplotlib.lines.Line2D at 0x164b3228a90>]
```



matplotlib

pyplot — Matplotlib 1.5.

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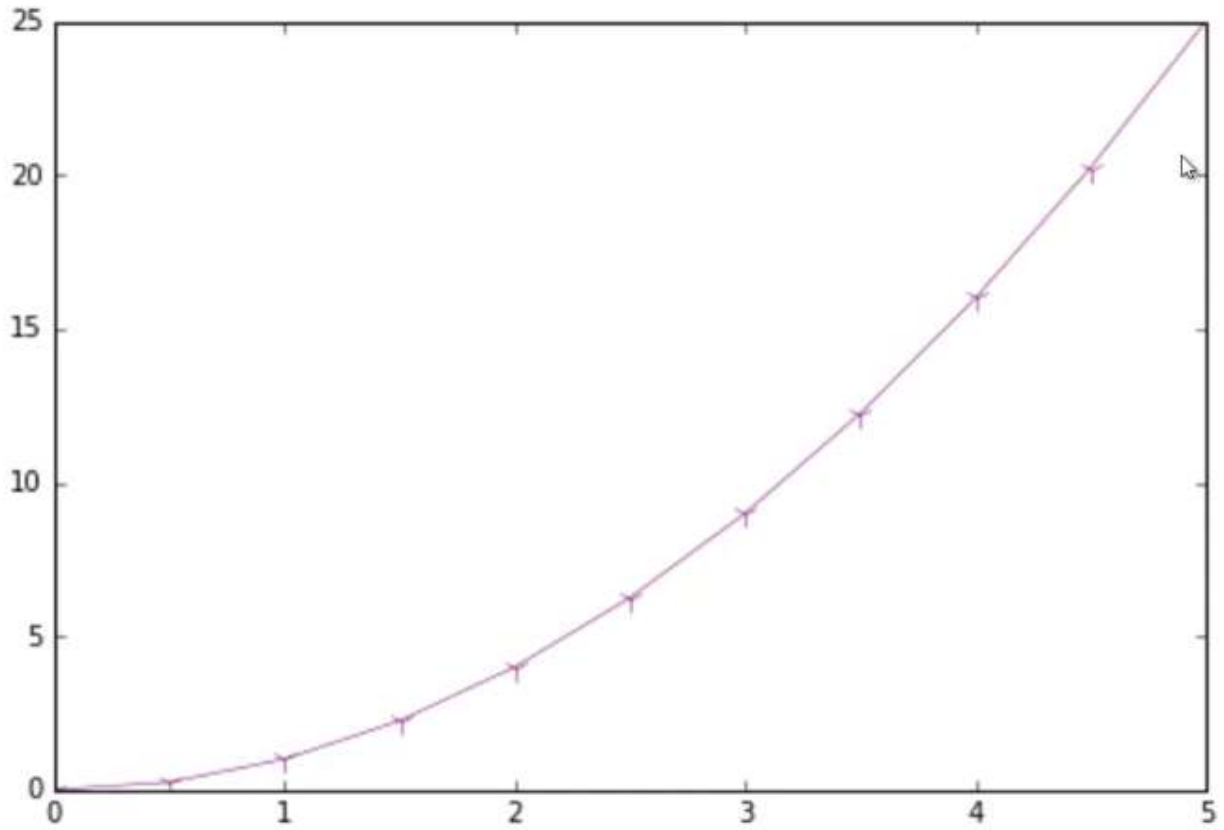
In [94]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=0.5,ls='-',marker='1',markersize=10)
```

Out[94]: [<matplotlib.lines.Line2D at 0x164b42b5ef0>]



matplotlib

pyplot — Matplotlib 1.5.

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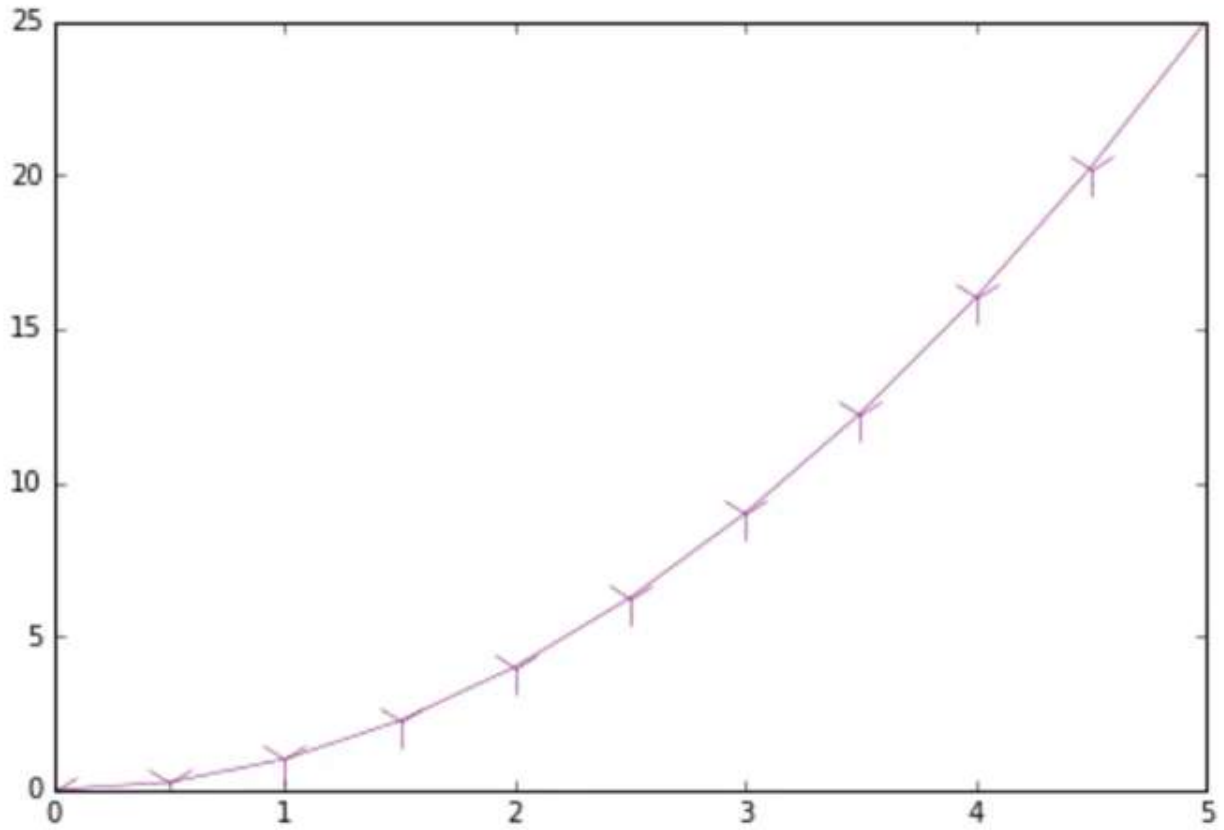
Python [conda env:py35]

In [95]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=0.5,ls='-',marker='',markersize=20)
```

Out[95]:
```
[<matplotlib.lines.Line2D at 0x164b4314518>]
```



matplotlib

pyplot — Matplotlib 1.5.

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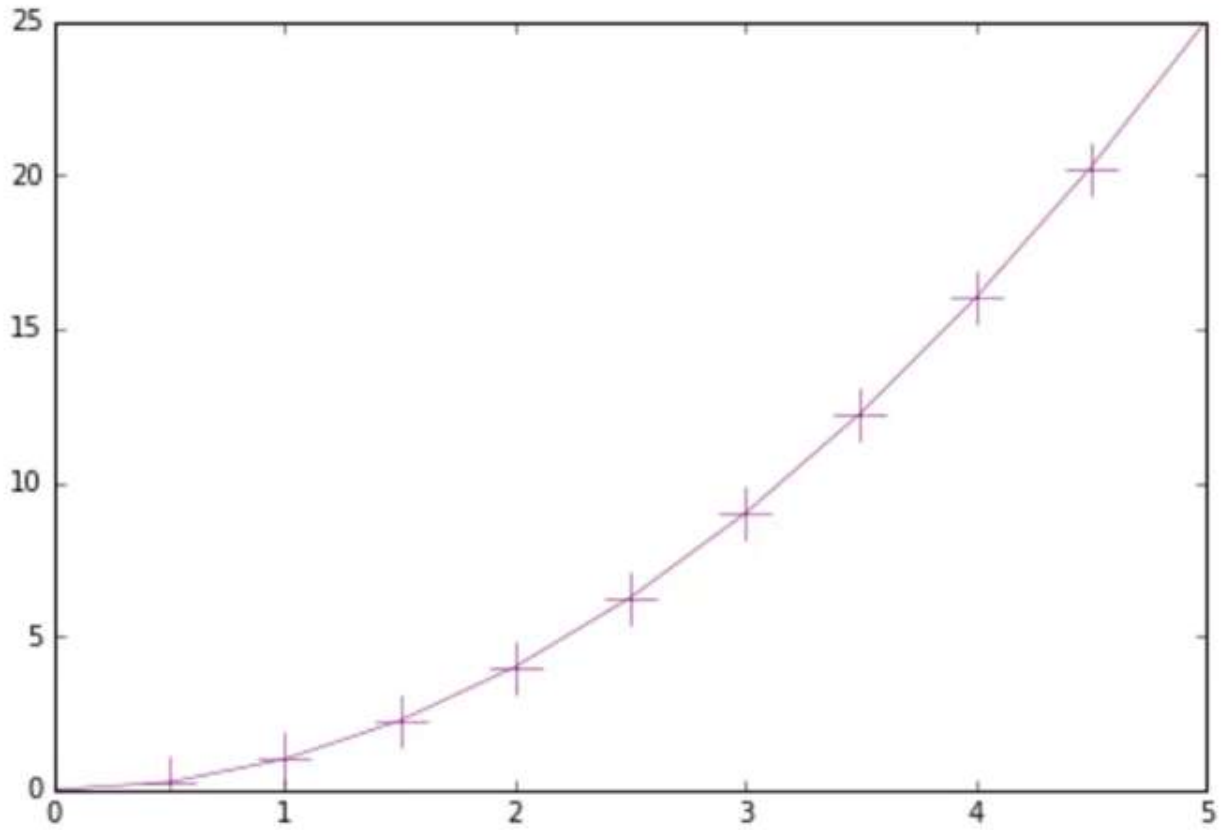
File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

In [97]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=0.5,ls='-',marker='+',markersize=20)
```

Out[97]: [<matplotlib.lines.Line2D at 0x164b43c8d30>]



matplotlib | pyplot — Matplotlib 1.5.

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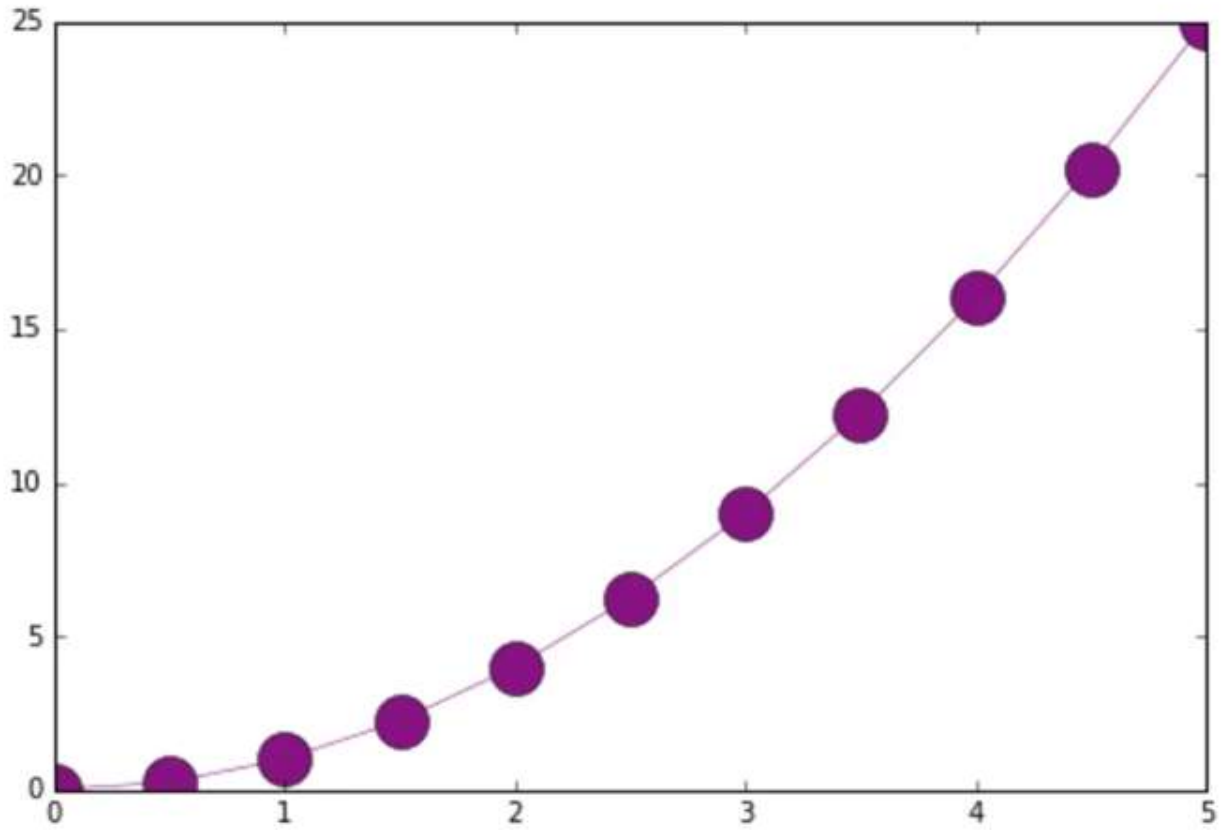
File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

In [98]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=0.5,ls='-',marker='o',markersize=20)
```

Out[98]: [<matplotlib.lines.Line2D at 0x164b4434358>]



matplotlib

pyplot — Matplotlib 1.5.

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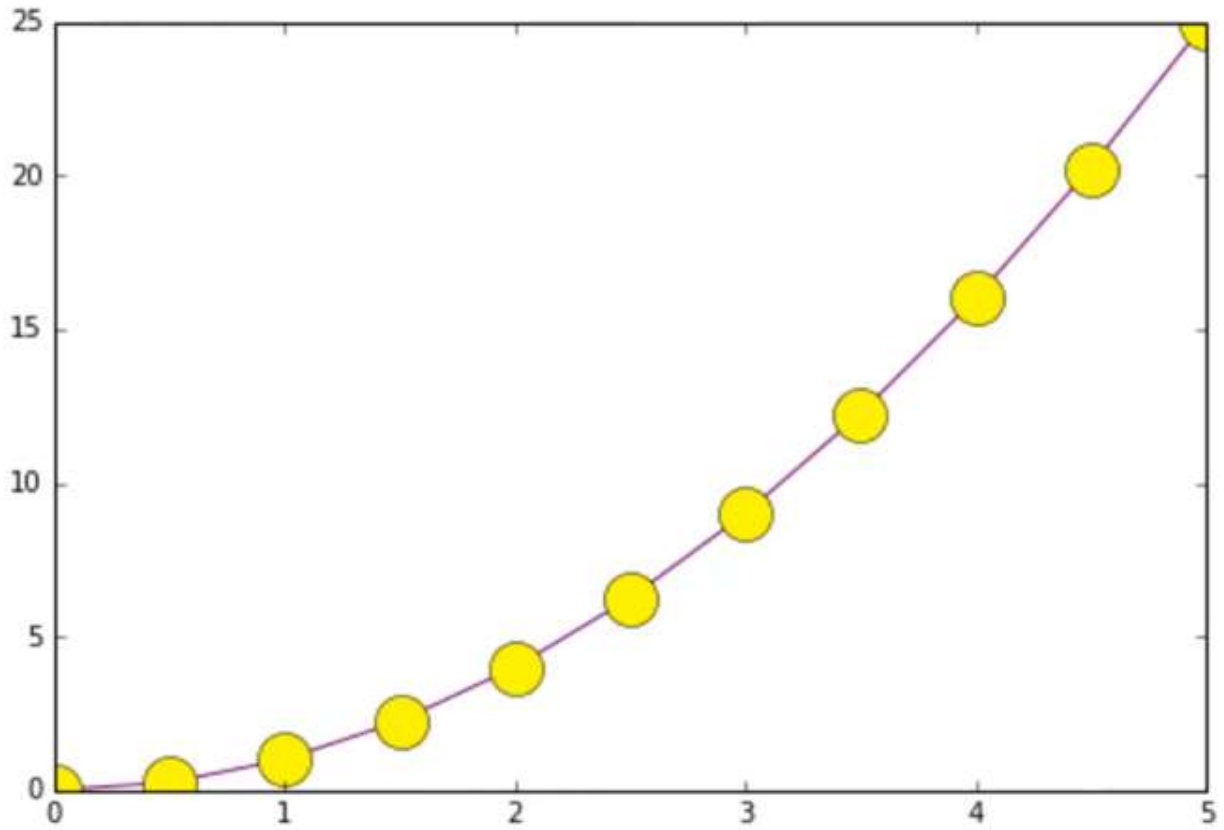
Python [conda env:py35]

In [100]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=1,ls='-',marker='o',markersize=20,
        markerfacecolor='yellow')
```

Out[100]:
```
[<matplotlib.lines.Line2D at 0x164b44e3128>]
```



matplotlib

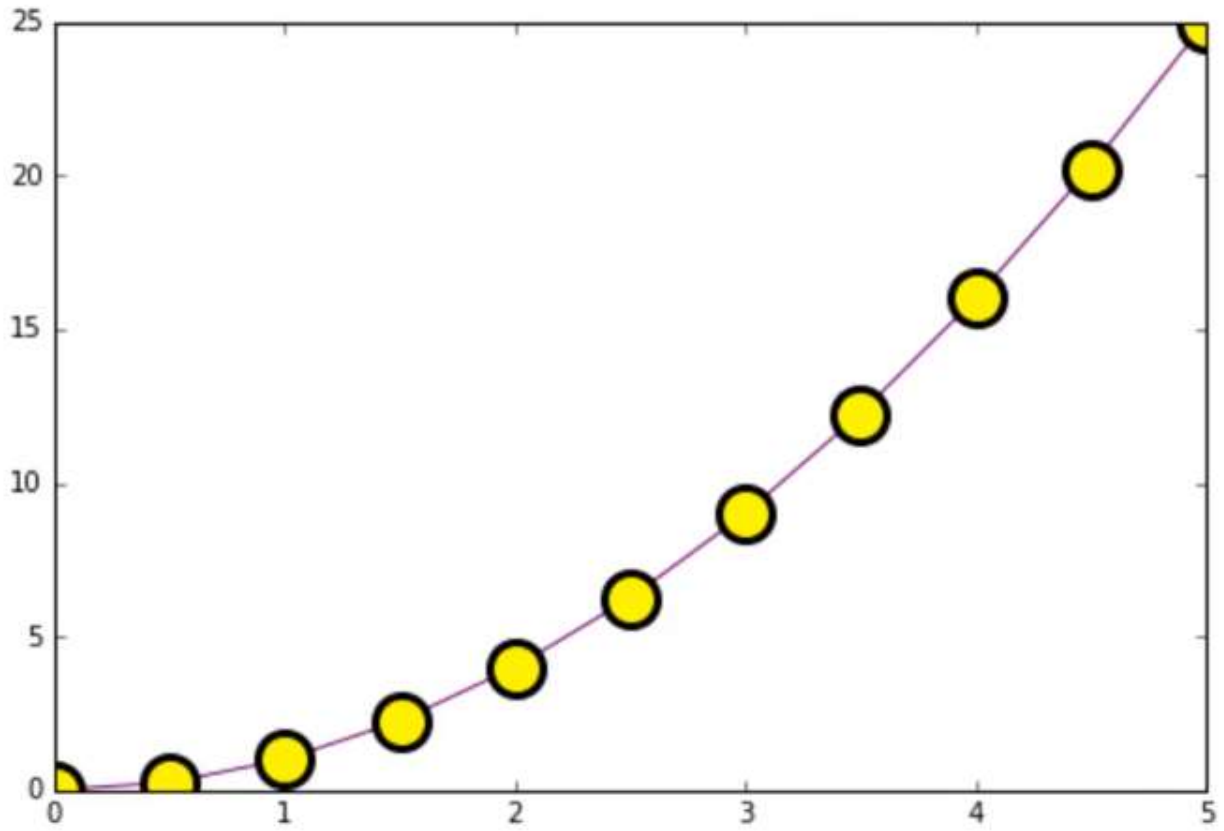
pyplot — Matplotlib 1.5.

localhost:8888/notebooks/Python-Data-Science-and-Machine-Learning-Bootcamp-master/Python-Data-Science-and-Machine-Learning-Bootcamp-master/Python-for-Data-Visualization/Matplotlib/matplotlib.ipynb

File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

In [101]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=1,ls='-',marker='o',markersize=20,
        markerfacecolor='yellow',markeredgewidth=3)
```

Out[101]:
```
[<matplotlib.lines.Line2D at 0x164b454bc50>]
```



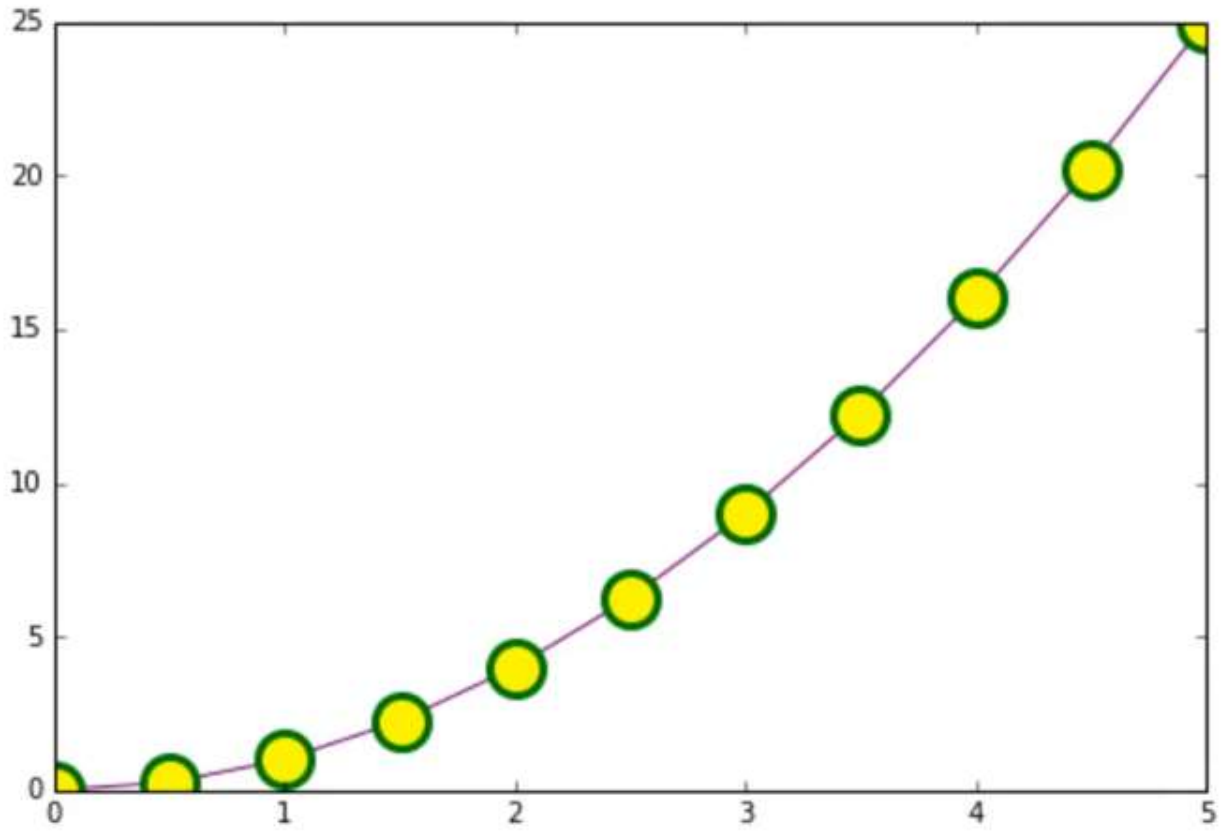
matplotlib | pyplot — Matplotlib 1.5.

localhost:8888/notebooks/Python-Data-Science-and-Machine-Learning-Bootcamp-master/Python-Data-Science-and-Machine-Learning-Bootcamp-master/Python-for-Data-Visualization/Matplotlib/matplotlib.ipynb

File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

In [102]:
```
fig = plt.figure()

ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=1,ls='-',marker='o',markersize=20,
        markerfacecolor='yellow',markeredgewidth=3,markeredgecolor='green')
```

Out[102]:
```
[<matplotlib.lines.Line2D at 0x164b45b1198>]
```



jupyter Matplotlib Concepts Lecture (autosaved)

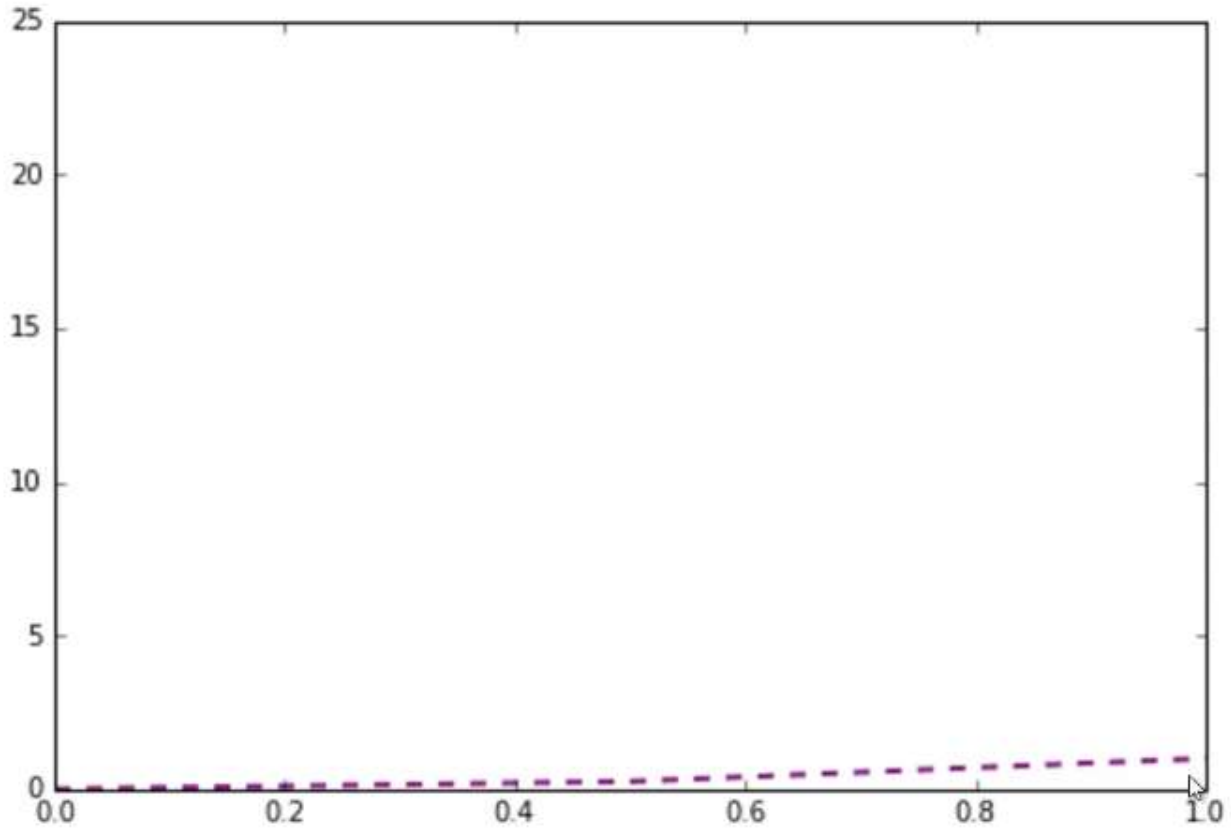
Check this file.

File Edit View Insert Cell Kernel Widgets Help Python [default]

```
ax.plot(x, x+2, color="red", linewidth=0.50)
ax.plot(x, x+3, color="red", linewidth=1.00)
ax.plot(x, x+4, color="red", linewidth=2.00)

# possible linestype options '-', '--', '-.', ':', 'steps'
ax.plot(x, x+5, color="green", lw=3, linestyle='-')
ax.plot(x, x+6, color="green", lw=3, ls='-.')
ax.plot(x, x+7, color="green", lw=3, ls=':')

# custom dash
line, = ax.plot(x, x+8, color="black", lw=1.50)
line.set_dashes([5, 10, 15, 10]) # format: line length, space length, ...

# possible marker symbols: marker = '+', 'o', '*', 's', ',', '.', '1', '2', '3',
ax.plot(x, x+ 9, color="blue", lw=3, ls='-', marker='+')
ax.plot(x, x+10, color="blue", lw=3, ls='--', marker='o')
ax.plot(x, x+11, color="blue", lw=3, ls='-', marker='s')
ax.plot(x, x+12, color="blue", lw=3, ls='--', marker='1')

# marker size and color
ax.plot(x, x+13, color="purple", lw=1, ls='-', marker='o', markersize=2)
ax.plot(x, x+14, color="purple", lw=1, ls='-', marker='o', markersize=4)
ax.plot(x, x+15, color="purple", lw=1, ls='-', marker='o', markersize=8, markerfa
ax.plot(x, x+16, color="purple", lw=1, ls='-', marker='s', markersize=8,
        markerfacecolor="yellow", markeredgewidth=3, markeredgecolor="green");
```

```
ax = fig.add_axes([0,0,1,1])

ax.plot(x,y,color='purple',lw=2,ls='--')

ax.set_xlim([0,1])
```

Out[104]: (0, 1)



In [86]: x

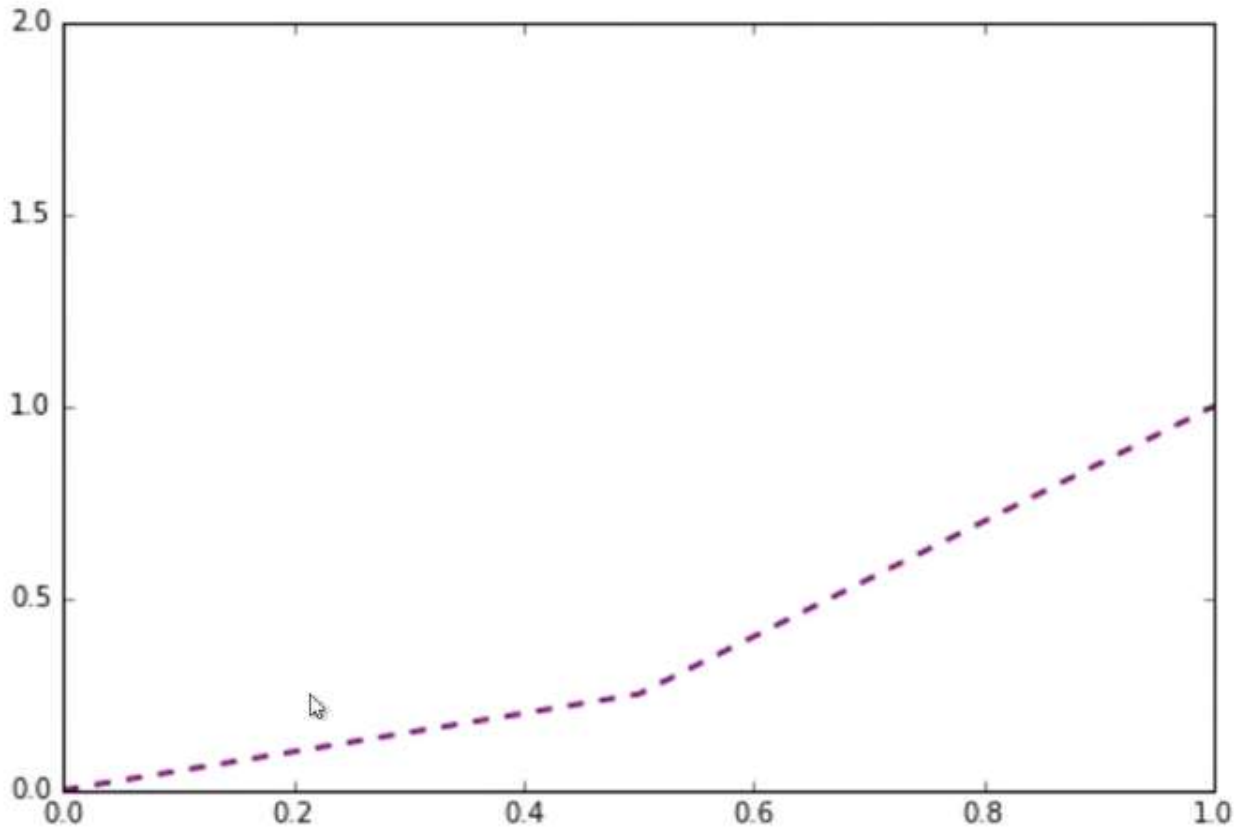
matplotlib

localhost:8888/notebooks/Python-Data-Science-and-Machine-Learning-Bootcamp-master/Python-Data-Science-and-Machine-Learning-Bootcamp-master/Python-for-Data-Visualization/Matplotlib/matplotlib.ipynb

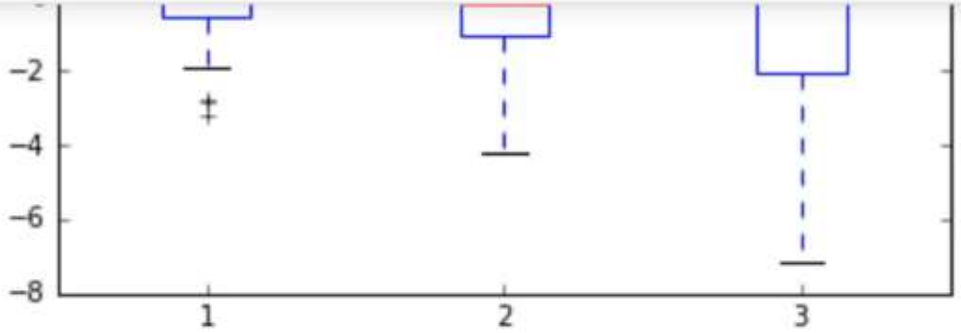
File Edit View Insert Cell Kernel Widgets Help | Python [conda env:py35]

```
ax.set_xlim([0,1])
ax.set_ylim([0,2])
```

Out[105]: (0, 2)



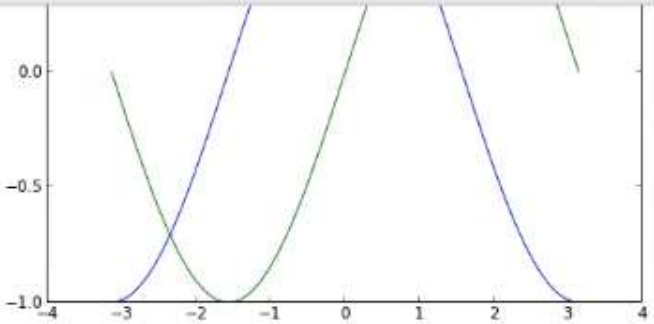
In [86]:
```
x
```



Further reading

- http://www.matplotlib.org - The project web page for matplotlib.
- https://github.com/matplotlib/matplotlib - The source code for matplotlib.
- http://matplotlib.org/gallery.html - A large gallery showcaseing various types of plots matplotlib can create. Highly recommended!
- http://www.loria.fr/~rougier/teaching/matplotlib - A good matplotlib tutorial.
- http://scipy-lectures.github.io/matplotlib/matplotlib.html - Another good matplotlib reference.

```
X = np.linspace(-np.pi, np.pi, 256, endpoint=True)
C,S = np.cos(X), np.sin(X)

plt.plot(X,C)
plt.plot(X,S)

plt.show()
```

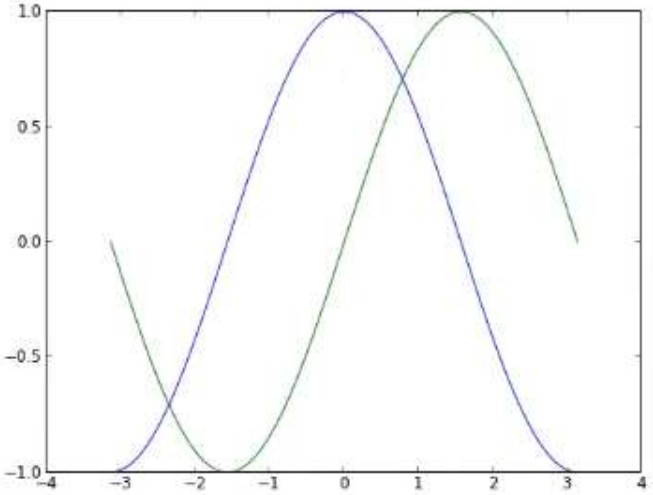


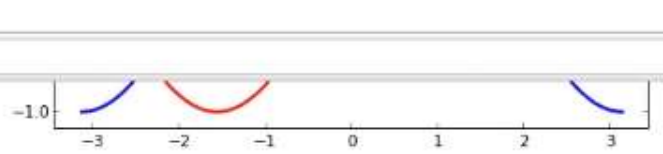
Instantiating defaults

Documentation
Customizing matplotlib

In the script below, we've instantiated (and commented) all the figure settings that influence the appearance of the plot. The settings have been explicitly set to their default values, but now you can interactively play with the values to explore their affect (see Line properties and Line styles below).

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

# Create a new figure of size 8x6 points, using 100 dots per inch
plt.figure(figsize=(8,6), dpi=80)

# Create a new subplot from a grid of 1x1
plt.subplot(111)

X = np.linspace(-np.pi, np.pi, 256,endpoint=True)
C,S = np.cos(X), np.sin(X)

# Plot cosine using blue color with a continuous line of width 1 (pixels)
plt.plot(X, C, color="blue", linewidth=1.0, linestyle="-")

# Plot sine using green color with a continuous line of width 1 (pixels)
plt.plot(X, S, color="green", linewidth=1.0, linestyle="-")

# Set x limits
plt.xlim(-4.0,4.0)

# Set x ticks
plt.xticks(np.linspace(-4,4,9,endpoint=True))

# Set y limits
plt.ylim(-1.0,1.0)

# Set y ticks
plt.yticks(np.linspace(-1,1,5,endpoint=True))
```



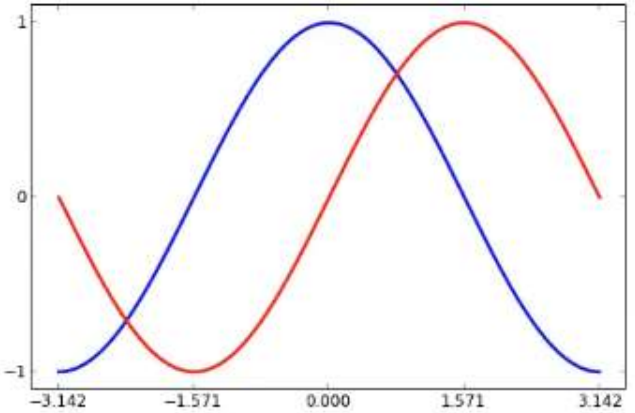


Setting ticks

Documentation
xticks() command
yticks() command
Tick container
Tick locating and formatting

Current ticks are not ideal because they do not show the interesting values (+/-π,+/-π/2) for sine and cosine. We'll change them such that they show only these values.

```
...
plt.xticks( [-np.pi, -np.pi/2, 0, np.pi/2, np.pi])
plt.yticks([-1, 0, +1])
...
```



Setting tick labels

Documentation
Working with text
xticks() command
yticks() command
set_xticklabels()
set_yticklabels()

Ticks are now properly placed but their label is not very explicit. We could guess that 3.142 is π but it would be better to make it explicit. When we set tick values, we can also provide a corresponding label in the second argument list. Note that we'll use latex to allow for nice rendering of the label.

```
...
plt.xticks([-np.pi, -np.pi/2, 0, np.pi/2, np.pi],
       [r'$-\pi$', r'$-\pi/2$', r'$0$', r'$+\pi/2$', r'$+\pi$'])

plt.yticks([-1, 0, +1],
       [r'$-1$', r'$0$', r'$+1$'])
...
```