Creating multiple subplots using `plt.subplots`

`pyplot.subplots` creates a figure and a grid of subplots with a single call, while providing reasonable control over how the individual plots are created. For more advanced use cases you can use `GridSpec` for a more general subplot layout or `Figure.add_subplot` for adding subplots at arbitrary locations within the figure.

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

# Some example data to display
x = np.linspace(0, 2 * np.pi, 400)
y = np.sin(x ** 2)
```

A figure with just one subplot

`subplots()` without arguments returns a `Figure` and a single `Axes`.

This is actually the simplest and recommended way of creating a single Figure and Axes.

```
fig, ax = plt.subplots()
ax.plot(x, y)
ax.set_title('A single plot')
```

Table of Contents

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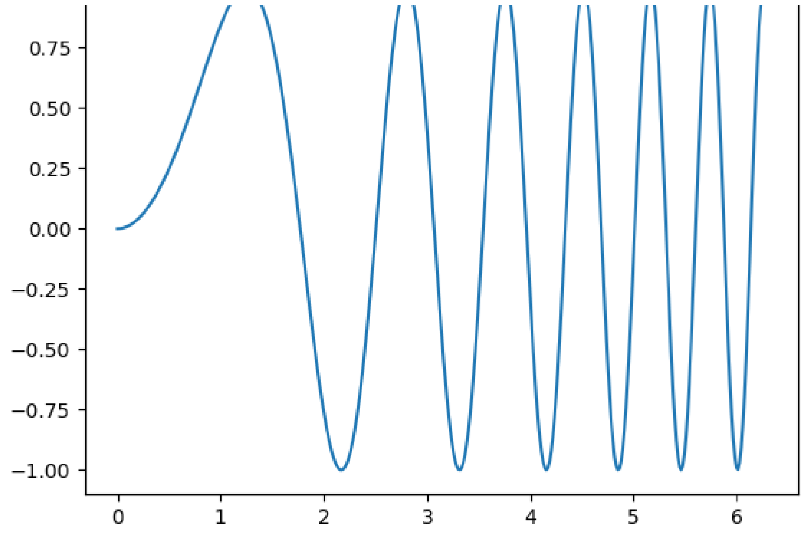


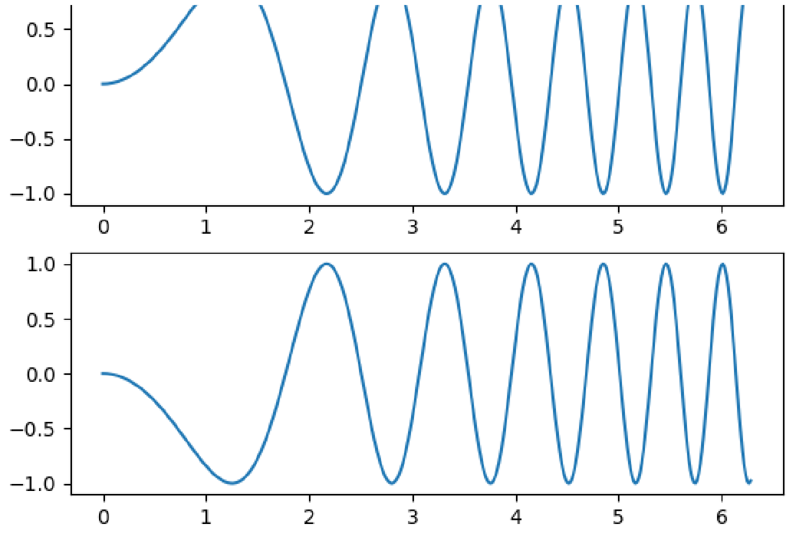
Out:
```
Text(0.5, 1.0, 'A single plot')
```

Stacking subplots in one direction

The first two optional arguments of `pyplot.subplots` define the number of rows and columns of the subplot grid.

When stacking in one direction only, the returned `axs` is a 1D numpy array containing the list of created Axes.

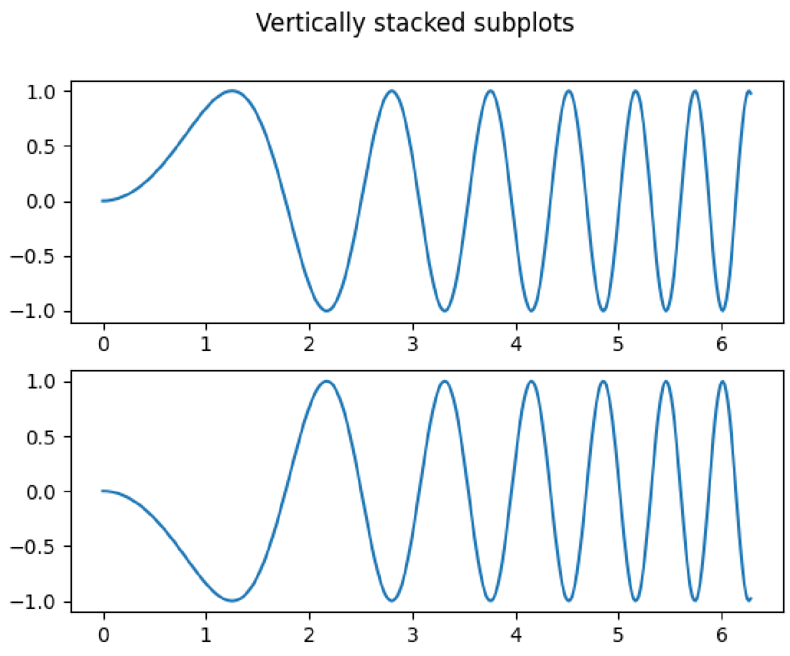
```
fig, axs = plt.subplots(2)
fig.suptitle('Vertically stacked subplots')
axs[0].plot(x, y)
axs[1].plot(x, -y)
```



Out:
```
[<matplotlib.lines.Line2D object at 0x7fd64198a760>]
```

If you are creating just a few Axes, it's handy to unpack them immediately to dedicated variables for each Axes. That way, we can use `ax1` instead of the more verbose `axs[0]`.

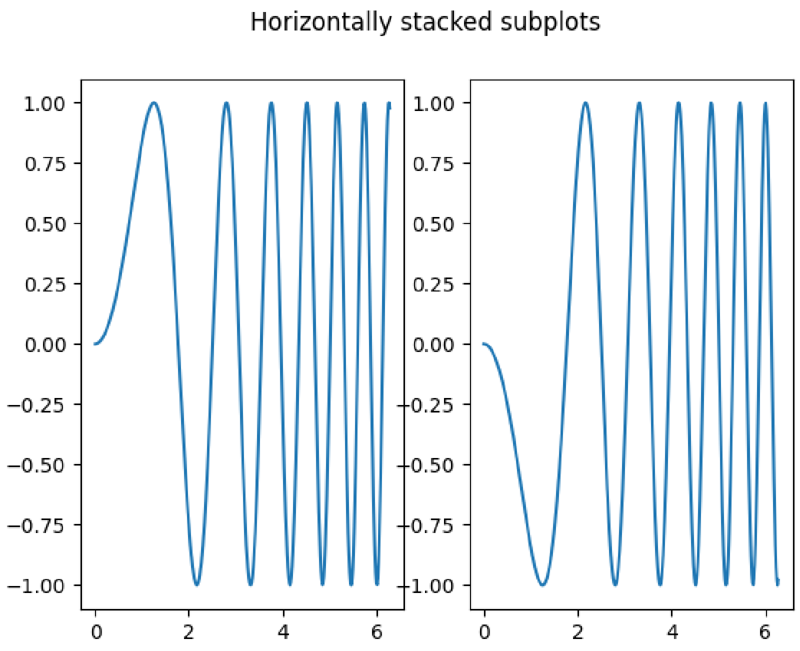
```
fig, (ax1, ax2) = plt.subplots(2)
fig.suptitle('Vertically stacked subplots')
ax1.plot(x, y)
ax2.plot(x, -y)
```



Out:
```
[<matplotlib.lines.Line2D object at 0x7fd63fb68c40>]
```

two columns:

```
fig, (ax1, ax2) = plt.subplots(1, 2)
fig.suptitle('Horizontally stacked subplots')
ax1.plot(x, y)
ax2.plot(x, -y)
```



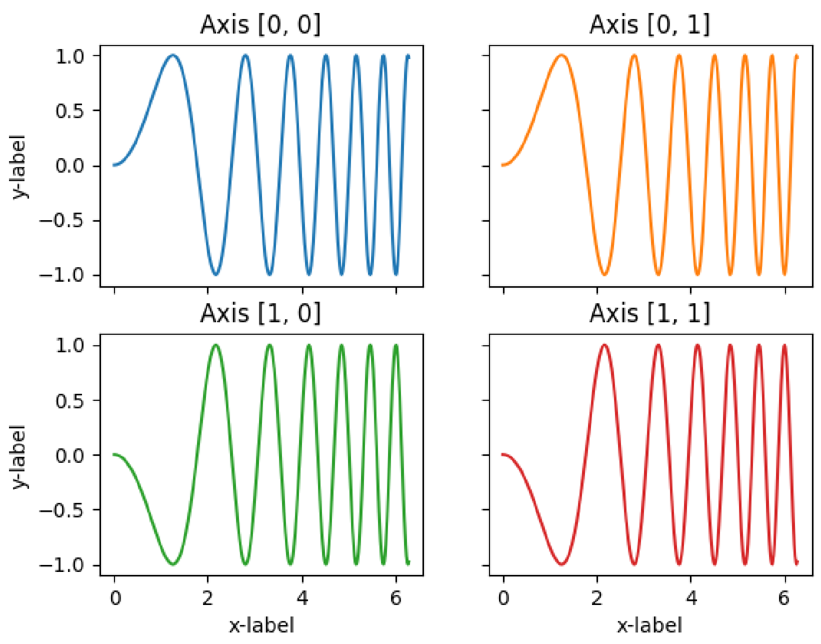
Out:
```
[<matplotlib.lines.Line2D object at 0x7fd6405a8820>]
```

Stacking subplots in two directions

When stacking in two directions, the returned `axs` is a 2D NumPy array.

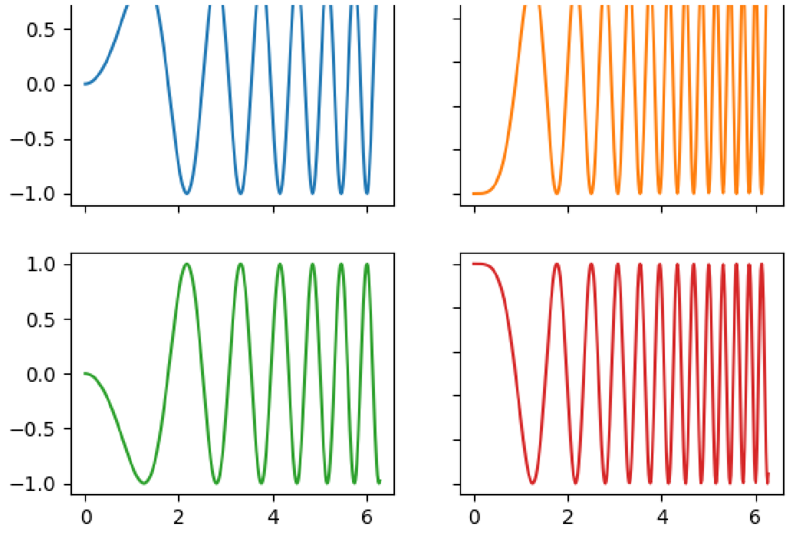
If you have to set parameters for each subplot it's handy to iterate over all subplots in a 2D grid using `for ax in axs.flat:`.

```
fig, axs = plt.subplots(2, 2)
axs[0, 0].plot(x, y)
axs[0, 0].set_title('Axis [0, 0]')
axs[0, 1].plot(x, y, 'tab:orange')
axs[0, 1].set_title('Axis [0, 1]')
axs[1, 0].plot(x, -y, 'tab:green')
axs[1, 0].set_title('Axis [1, 0]')
axs[1, 1].plot(x, -y, 'tab:red')
axs[1, 1].set_title('Axis [1, 1]')

for ax in axs.flat:
    ax.set(xlabel='x-label', ylabel='y-label')

# Hide x labels and tick labels for top plots and y ticks
```



You can use tuple-unpacking also in 2D to assign all subplots to dedicated variables:

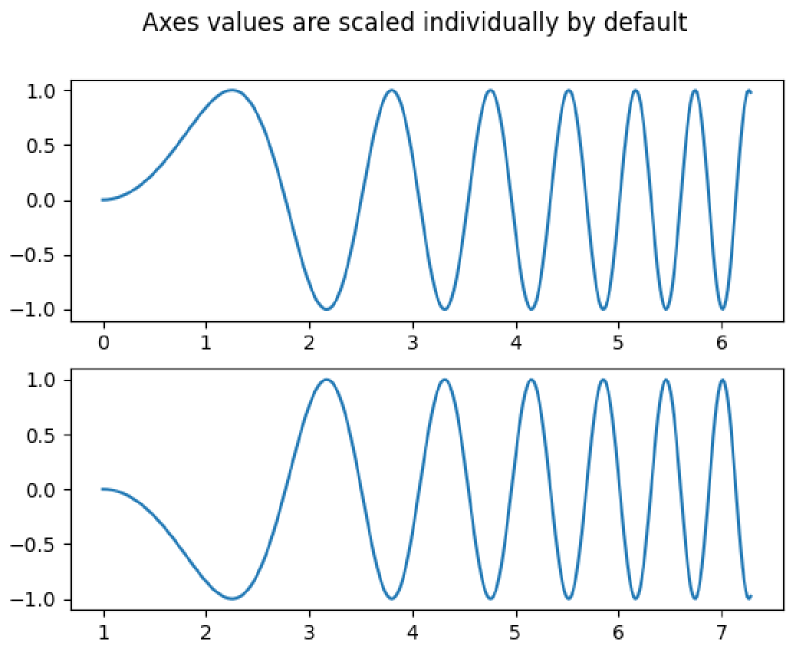
```
fig, ((ax1, ax2), (ax3, ax4)) = plt.subplots(2, 2)
fig.suptitle('Sharing x per column, y per row')
ax1.plot(x, y)
ax2.plot(x, y**2, 'tab:orange')
ax3.plot(x, -y, 'tab:green')
ax4.plot(x, -y**2, 'tab:red')

for ax in fig.get_axes():
    ax.label_outer()
```



Sharing axes

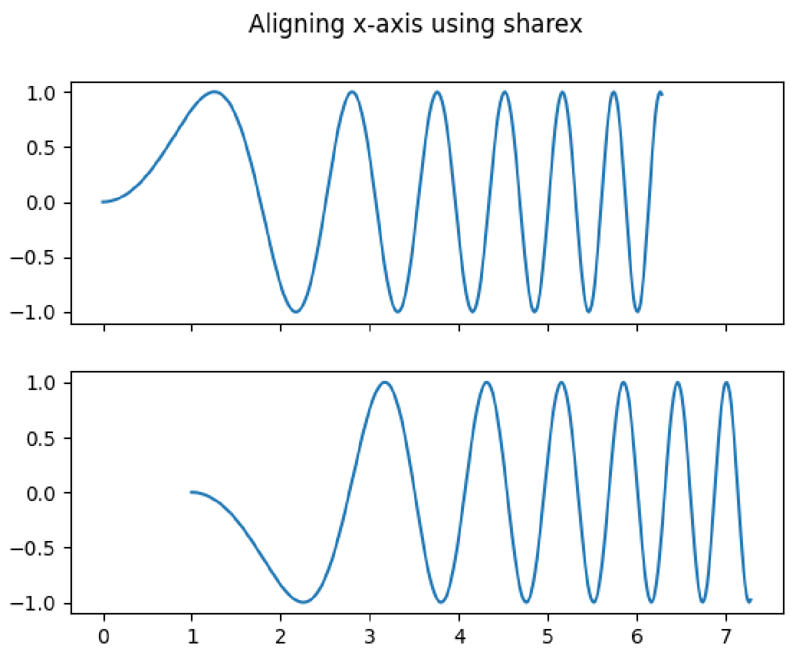
By default, each Axes is scaled individually. Thus, if the ranges are different the tick values of the subplots do not align.

```
fig, (ax1, ax2) = plt.subplots(2)
fig.suptitle('Axes values are scaled individually by defau
ax1.plot(x, y)
ax2.plot(x + 1, -y)
```



Out:
```
[<matplotlib.lines.Line2D object at 0x7fd640752370>]
```

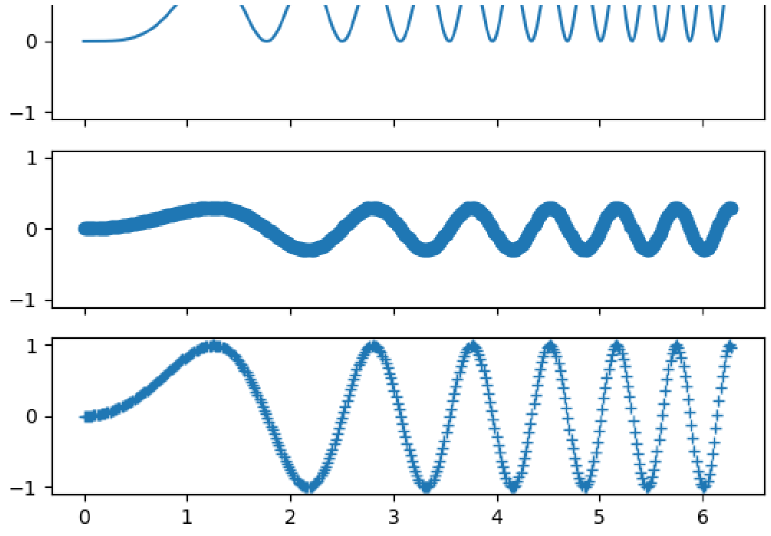
```
fig.suptitle('Aligning x-axis using sharex')
ax1.plot(x, y)
ax2.plot(x + 1, -y)
```



Out:
```
[<matplotlib.lines.Line2D object at 0x7fd640838550>]
```

Setting *sharex* or *sharey* to `True` enables global sharing across the whole grid, i.e. also the y-axes of vertically stacked subplots have the same scale when using `sharey=True`.

```
fig, axs = plt.subplots(3, sharex=True, sharey=True)
fig.suptitle('Sharing both axes')
axs[0].plot(x, y ** 2)
axs[1].plot(x, 0.3 * y, 'o')
axs[2].plot(x, y, '+')
```



Out:

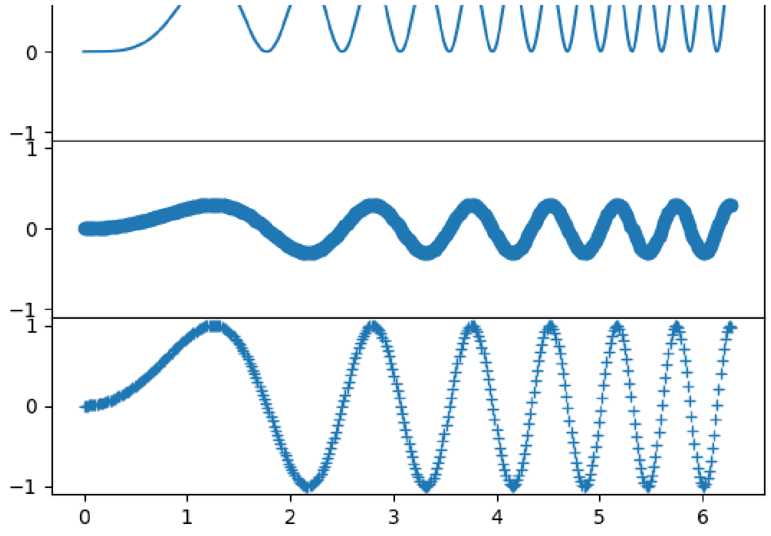
```
[<matplotlib.lines.Line2D object at 0x7fd63fecf580>]
```

For subplots that are sharing axes one set of tick labels is enough. Tick labels of inner Axes are automatically removed by *sharex* and *sharey*. Still there remains an unused empty space between the subplots.

To precisely control the positioning of the subplots, one can explicitly create a `GridSpec` with `add_gridspec`, and then call its `subplots` method. For example, we can reduce the height between vertical subplots using `add_gridspec(hspace=0)`.

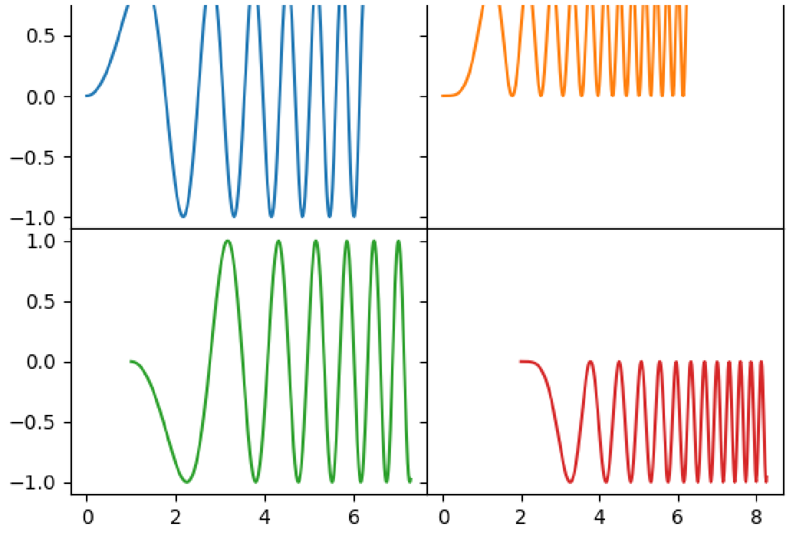
`label_outer` is a handy method to remove labels and ticks from subplots that are not at the edge of the grid.

```
fig = plt.figure()
gs = fig.add_gridspec(3, hspace=0)
axs = gs.subplots(sharex=True, sharey=True)
fig.suptitle('Sharing both axes')
axs[0].plot(x, y ** 2)
axs[1].plot(x, 0.3 * y, 'o')
axs[2].plot(x, y, '+')

# Hide x labels and tick labels for all but bottom plot.
for ax in axs:
    ax.label_outer()
```



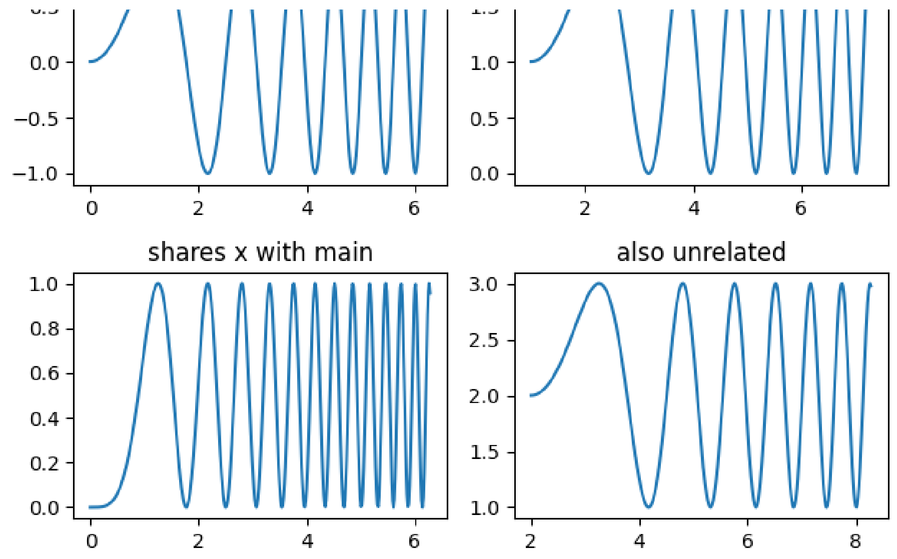
Apart from `True` and `False`, both *sharex* and *sharey* accept the values 'row' and 'col' to share the values only per row or column.

```
fig = plt.figure()
gs = fig.add_gridspec(2, 2, hspace=0, wspace=0)
(ax1, ax2), (ax3, ax4) = gs.subplots(sharex='col', sharey=
fig.suptitle('Sharing x per column, y per row')
ax1.plot(x, y)
ax2.plot(x, y**2, 'tab:orange')
ax3.plot(x + 1, -y, 'tab:green')
ax4.plot(x + 2, -y**2, 'tab:red')

for ax in axs.flat:
    ax.label_outer()
```



If you want a more complex sharing structure, you can first create the grid of axes with no sharing, and then call `axes.Axes.sharex` or `axes.Axes.sharey` to add sharing info a posteriori.

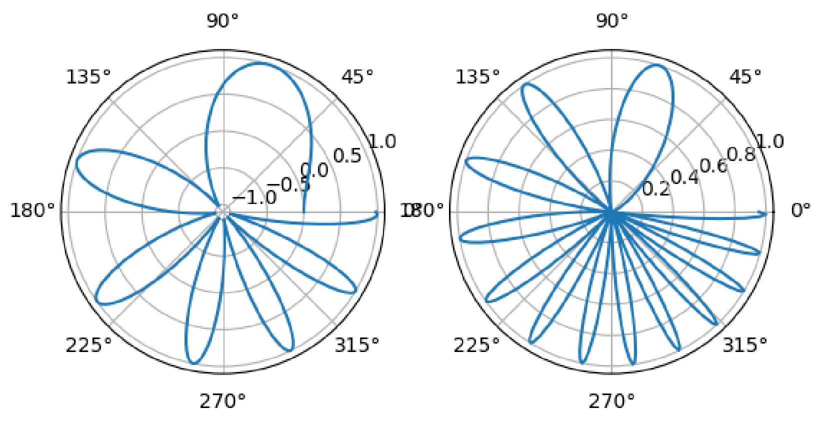
```python
fig, axs = plt.subplots(2, 2)
axs[0, 0].plot(x, y)
axs[0, 0].set_title("main")
axs[1, 0].plot(x, y**2)
axs[1, 0].set_title("shares x with main")
axs[1, 0].sharex(axs[0, 0])
axs[0, 1].plot(x + 1, y + 1)
axs[0, 1].set_title("unrelated")
axs[1, 1].plot(x + 2, y + 2)
axs[1, 1].set_title("also unrelated")
fig.tight_layout()
```



Polar axes

The parameter *subplot_kw* of `pyplot.subplots` controls the subplot properties (see also `Figure.add_subplot`). In particular, this can be used to create a grid of polar Axes.

```
fig, (ax1, ax2) = plt.subplots(1, 2, subplot_kw=dict(proje
ax1.plot(x, y)
ax2.plot(x, y ** 2)

plt.show()
```



Total running time of the script: (0 minutes 7.389 seconds)

`Download Jupyter notebook: subplots_demo.ipynb`