np_matplot_test

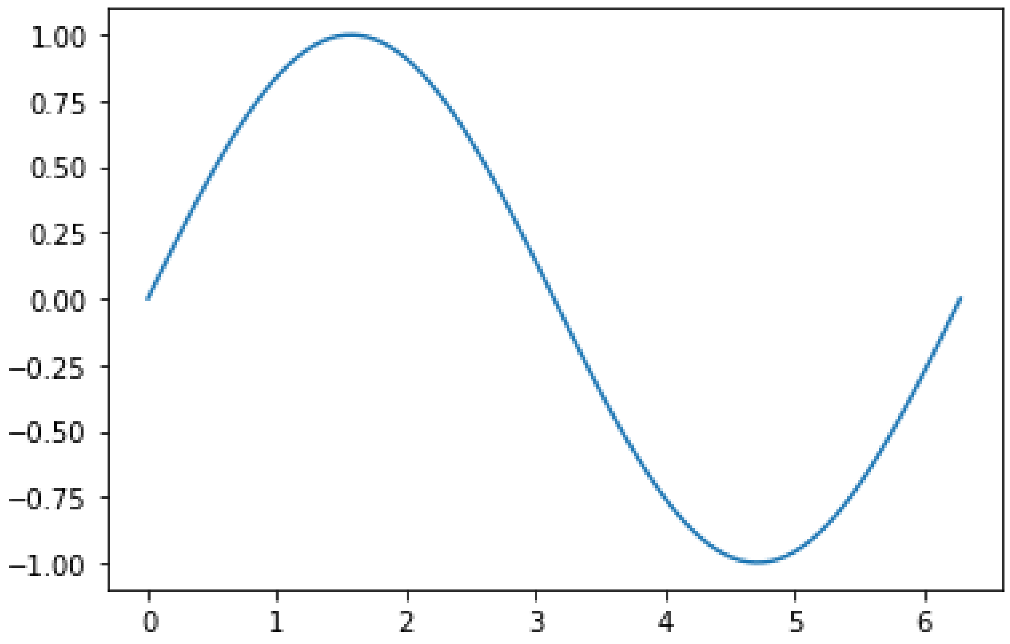
March 11, 2022

Numpy and matplotlib are been imported

```
[ ]: import numpy as np
     import matplotlib.pyplot as plt
```

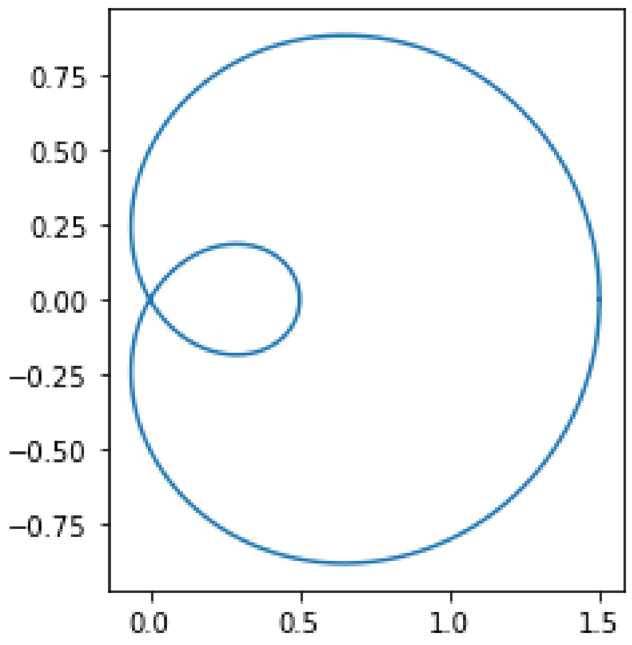
Create a basic sin(x) curve

```
[ ]: x = np.linspace(0, 2*np.pi, 100)
     y = np.sin(x)

     fig, ax = plt.subplots()
     ax.plot(x, y)
     plt.show()
```



Create curve with error bands

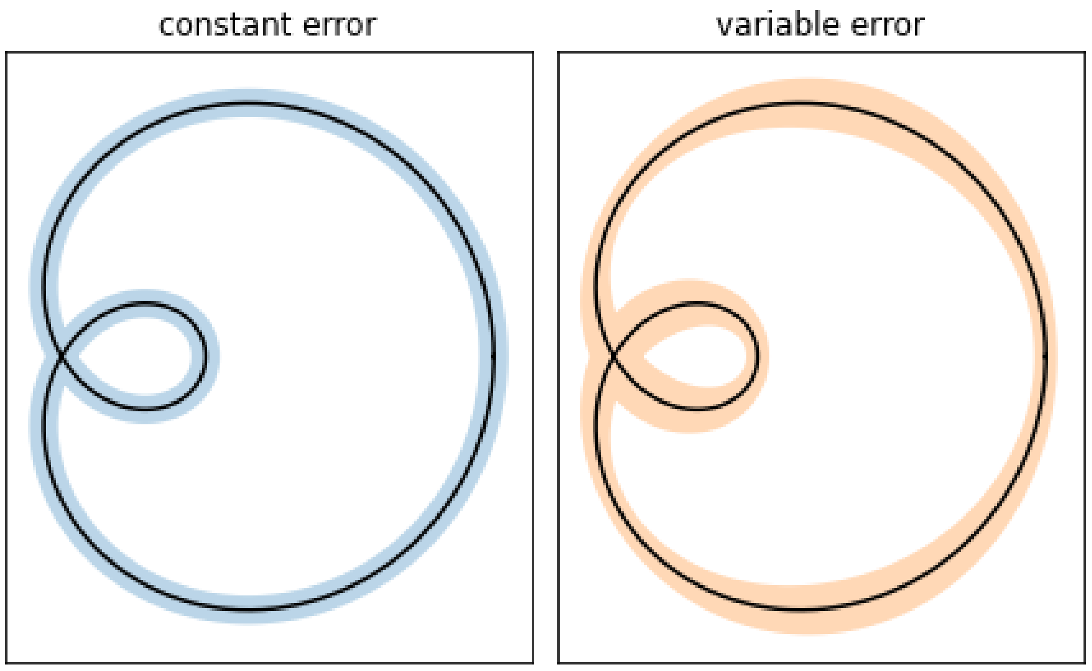
```
[ ]: from matplotlib.path import Path
     from matplotlib.patches import PathPatch

     N = 400
     t = np.linspace(0, 2*np.pi, N)
     r = 0.5 + np.cos(t)
     x, y = r * np.cos(t), r * np.sin(t)

     fig, ax = plt.subplots()
     ax.plot(x, y)
     ax.set_aspect(1)
```



Same than before, but with fill between

```
[ ]: def draw_error_band(ax, x, y, err, **kwargs):
         # Calculate normals via centered finite differences (except the first point
         # which uses a forward difference and the last point which uses a backward
         # difference).
         dx = np.concatenate([[x[1] - x[0]], x[2:] - x[:-2], [x[-1] - x[-2]]])
         dy = np.concatenate([[y[1] - y[0]], y[2:] - y[:-2], [y[-1] - y[-2]]])
         l = np.hypot(dx, dy)
         nx = dy / l
         ny = -dx / l

         # end points of errors
         xp = x + nx * err
```

```
    yp = y + ny * err
    xn = x - nx * err
    yn = y - ny * err

    vertices = np.block([[xp, xn[::-1]],
                         [yp, yn[::-1]]]).T
    codes = np.full(len(vertices), Path.LINETO)
    codes[0] = codes[len(xp)] = Path.MOVETO
    path = Path(vertices, codes)
    ax.add_patch(PathPatch(path, **kwargs))


axs = (plt.figure(constrained_layout=True)
       .subplots(1, 2, sharex=True, sharey=True))
errs = [
    (axs[0], "constant error", 0.05),
    (axs[1], "variable error", 0.05 * np.sin(2 * t) ** 2 + 0.04),
]
for i, (ax, title, err) in enumerate(errs):
    ax.set(title=title, aspect=1, xticks=[], yticks=[])
    ax.plot(x, y, "k")
    draw_error_band(ax, x, y, err=err,
                    facecolor=f"C{i}", edgecolor="none", alpha=.3)

plt.show()
```


constant error
variable error