The Maurer Rose

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Introduction

Maurer rose is a concept in geometry introduced by Peter. M. Maurer. Maurer rose are points connected on a rose curve.

Mathematics of Maurer roses

Circles

To generate a circle, we can either use polar plane where we describe points as

$$(r, \theta)$$

where $0 \leq \theta \leq 2\pi$, or we can use cartesian coordinates, where points are described as

$$x = r * \sin(\theta)$$
$$y = r * \cos(\theta)$$

Rose curve

To generate rose curve, we have to modify our coordinates

$$(\sin(n\theta), \theta)$$

or, alternatively

$$x = \sin(n\theta) * \sin(\theta)$$
$$y = \sin(n\theta) * \cos(\theta)$$

This will generate a rose looking shape where n dictates number of "petals". If n is odd, the rose will have n petals and if n is even, rose will have $2n$ petals. We can see $n = 3$ rose (Figure 1) and $n = 2$ rose (Figure 2).

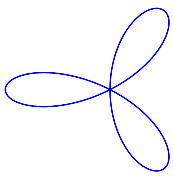


Figure 1: Rose curve with $n = 3$

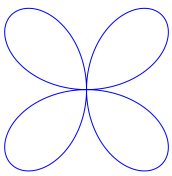


Figure 2: Rose curve with $n = 2$

Maurer rose

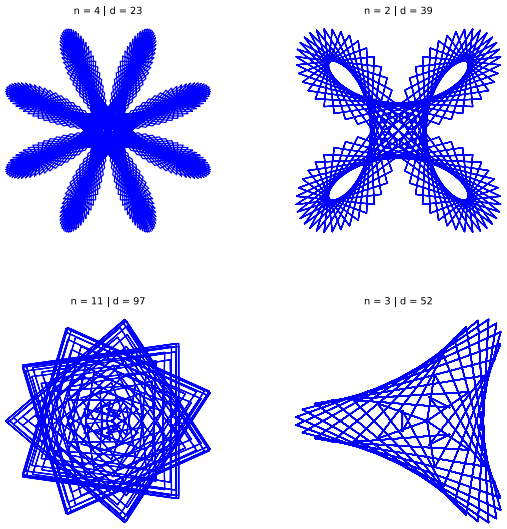
Peter M. Maurer described Maurer rose as a rose in a rose. For this case, we need to modify our coordinates a little more with addition of another parameter d. Resulting coordinates are

$$(\sin(n\theta), d\theta)$$

or

$$x = \sin(n\theta) * \sin(d\theta)$$
$$y = \sin(n\theta) * \cos(d\theta)$$

This will create shapes such as



Generation

I have generated these roses with this algorihm

```
for i in range(0,360,1):
      theta = i * (d*np.pi/180)
      r = np.sin(n*theta)

      xs.append(r * np.sin(theta))
      ys.append(r * np.cos(theta))
```

and then simply plotted `xs` and `xy`

```
fig, ax = plt.subplots(figsize=(5,5))
ax.plot(xs,ys, "b")
fig.savefig("rose.svg", transparent=True)
```