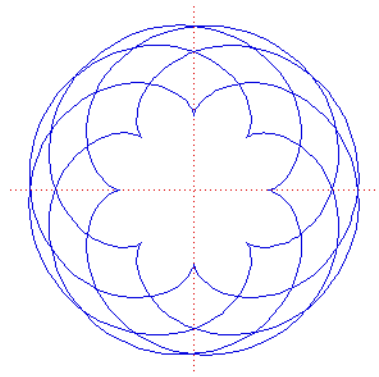
Famous Mathematical Curves

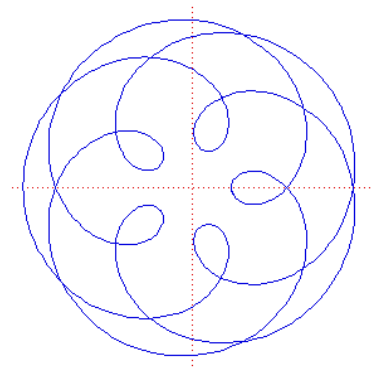
Epicycloid

$$x(\theta) = (R+r)\cos\theta - r\cos\left(\frac{R+r}{r}\theta\right)$$
$$y(\theta) = (R+r)\sin\theta - r\sin\left(\frac{R+r}{r}\theta\right),$$



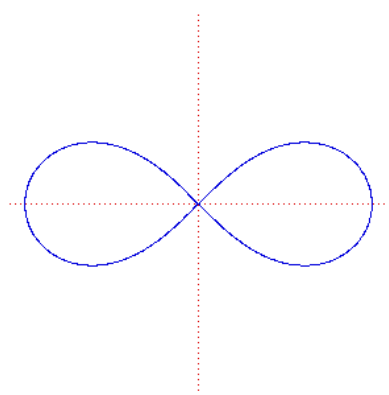
Epitrochoid

$$x(\theta) = (R+r)\cos\theta - d\cos\left(\frac{R+r}{r}\theta\right),$$
$$y(\theta) = (R+r)\sin\theta - d\sin\left(\frac{R+r}{r}\theta\right).$$



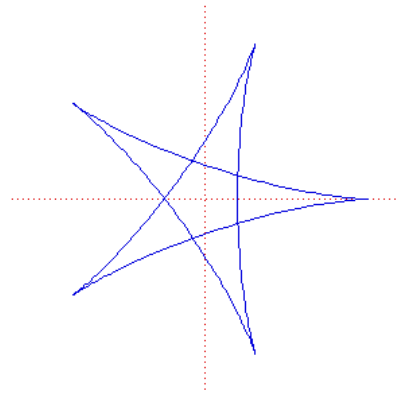
Lemniscate of Bernoulli

$$x = \frac{a\sqrt{2}\cos(t)}{\sin^2(t)+1}; \qquad y = \frac{a\sqrt{2}\cos(t)\sin(t)}{\sin^2(t)+1}$$



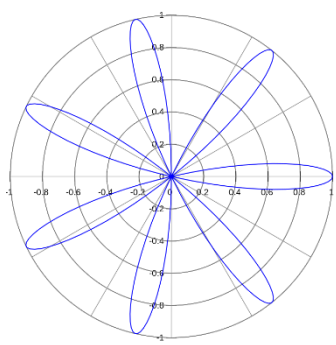
Hypocycloid Curve

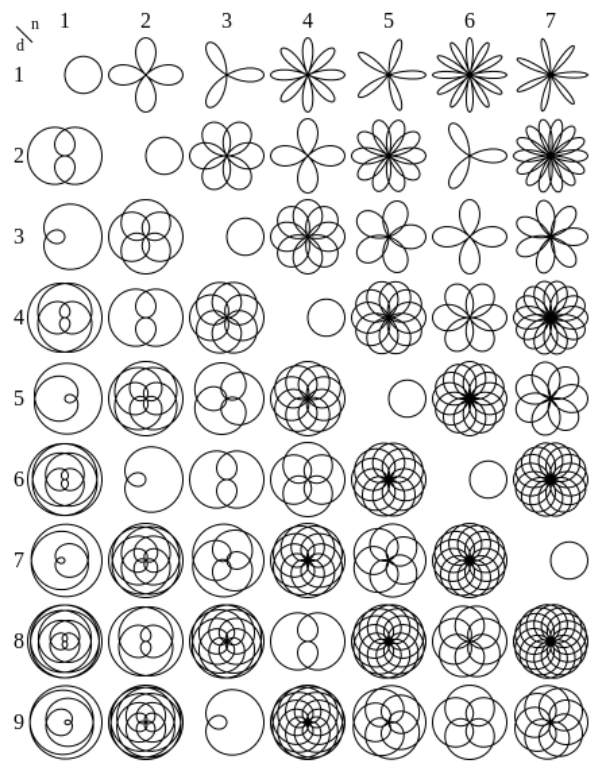
$$x(\theta) = (R - r)\cos\theta + r\cos\left(\frac{R-r}{r}\theta\right)$$
$$y(\theta) = (R - r)\sin\theta - r\sin\left(\frac{R-r}{r}\theta\right),$$



Rose / Rhodonea Curve

$$x = \cos(k\theta)\cos(\theta)$$
$$y = \cos(k\theta)\sin(\theta)$$





References:

http://www-history.mcs.st-and.ac.uk/Curves/Curves.html

https://en.wikipedia.org/wiki/Epicycloid

https://en.wikipedia.org/wiki/Epitrochoid

https://en.wikipedia.org/wiki/Lemniscate_of_Bernoulli

https://en.wikipedia.org/wiki/Hypocycloid

https://en.wikipedia.org/wiki/Rose_(mathematics)