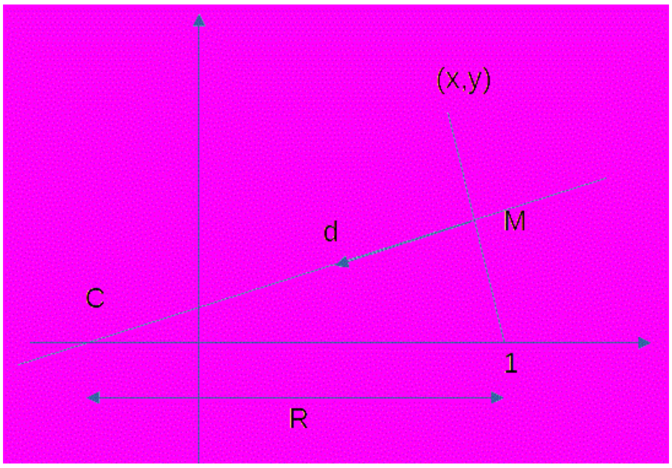
Evaluation of the curvature of a superellipse with “radius” 1 at the point (1,0)

Given any point (x,y) on the curve with x<1:

$$d=(-y, x-1)$$
$$M=(\frac{x-1}{2}, \frac{y}{2})$$



$$C=(1-R,0)=M+td$$
$$C=((x+1)/2-ty, y/2+t(x-1))$$

$$0=y/2+t(x-1)$$
$$t=\frac{-y}{2(x-1)}$$

$$1-R=(x+1)/2+\frac{y^2}{2(x-1)}$$
$$1-R=\frac{x^2-1+y^2}{2(x-1)}$$

where R is the curvature radius approximation.

Considering a superellipse with “radius” 1:

$$x^n+y^n=1 \qquad y^2=(1-x^n)^{(2/n)}$$

$$1-R(x)=\frac{x^2-1+(1-x^n)^{(2/n)}}{2(x-1)}$$

Taking the limit as x goes to 1:

$$\lim_{x\to 1} R(x)=1-\frac{2x-(2/n)(1-x^n)^{((2/n)-1)}}{2}$$

And applying l’Hôpital rule:

$$\lim_{x\to 1} R(x)=1-\lim_{x\to 1} x-(1-x^n)^{((2/n)-1)}$$

For n=2, as the exponent (2/n)-1 is zero for all x, then:

$$\lim_{x\to 1} R(x)=1$$

For n>2, as the exponent (2/n)-1 is less than zero for all x, then:

$$\lim_{x\to 1} R(x)=\infty$$