Examples of plotting curves from curvature.

We have seen that given a continuous function $\kappa\colon [a,b] \to \mathbb{R}$ that there is a curve $\mathbf{c}\colon [a,b] \to \mathbb{R}^2$ with curvature κ. On the class web page

`https://ralph-howard.com/Classes/Spring2024/551/`

You can down load the file

`plot_from_curvature.ipynb`

which lets you input the interval $[a,b]$ and the function κ and gives you a plot of the curve. Here are some examples, some of which I found surprising. The last two examples that show a small change in the curvature can make a large change in the shape of the curve. The next to last curve is has $\kappa(s) = 4 + 3\sin(s)$ on $[0, 20\pi]$ and the one after is has $\kappa(s) = 4.1 + 3\sin(s)$ on the same interval.

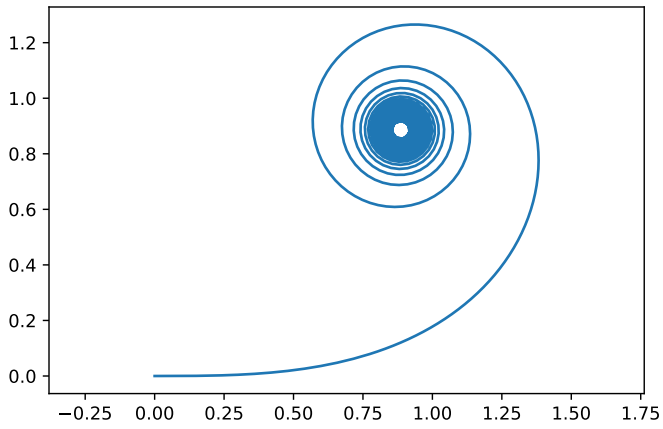

FIGURE 1. $\kappa(s) = s$ on the interval $[0, 30]$.

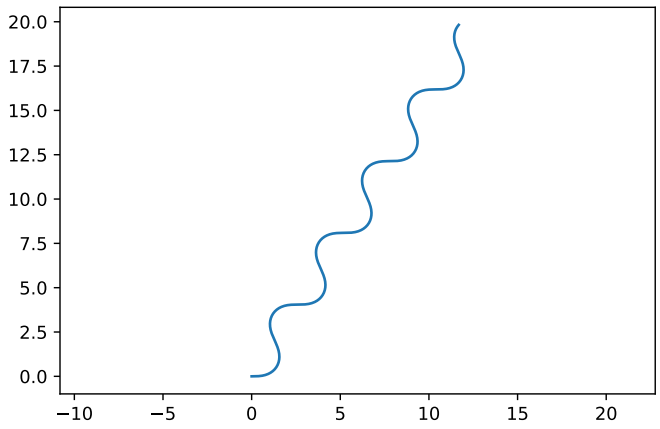

FIGURE 2. $\kappa(s) = \sin(s)$ on the interval $[0, 30]$.

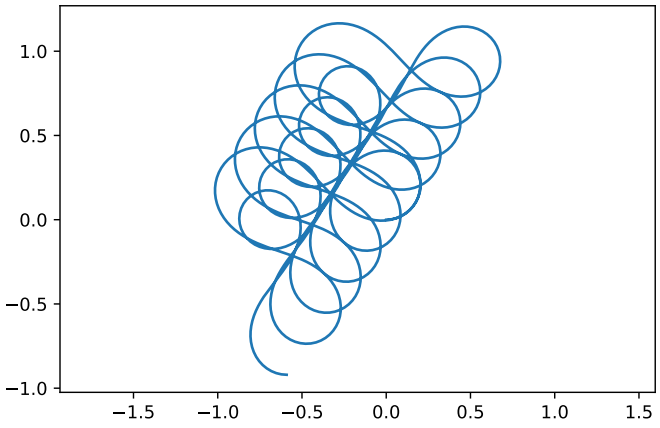

FIGURE 3. $\kappa(s) = \sin(s) + 5\cos(2s)$ on the interval $[0, 10\pi]$.

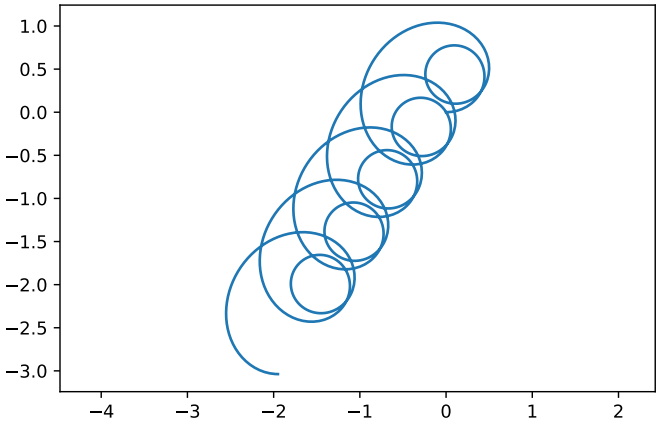

FIGURE 4. $\kappa(s) = \sin(s) + 2$ on the interval $[0, 10\pi]$.

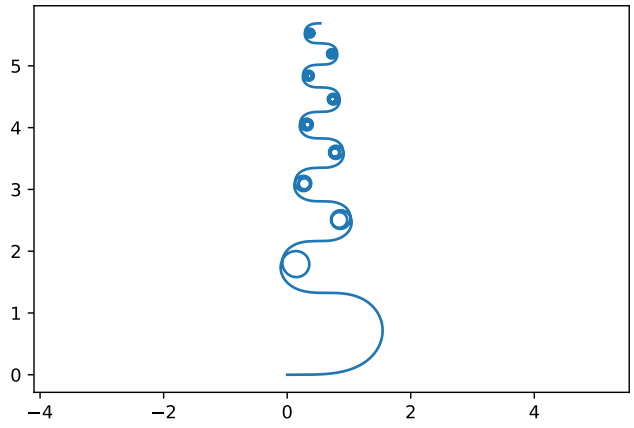

FIGURE 5. $\kappa(s) = e^s \sin(s)$ on the interval $[0, 10\pi]$.

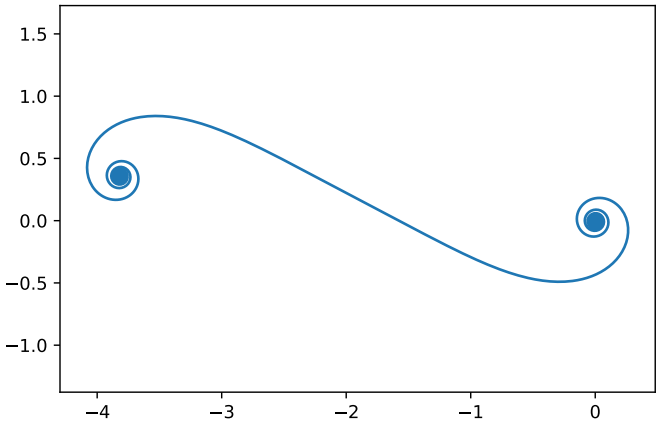

FIGURE 6. $\kappa(s) = s^3/5$ on the interval $[0, 10\pi]$.

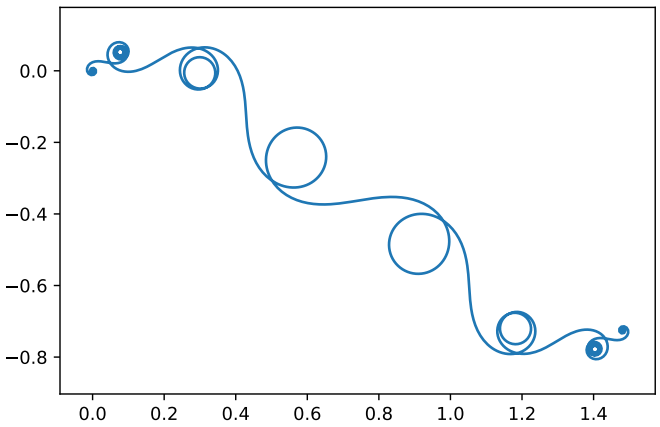

FIGURE 7. $\kappa(s) = s(s-1)(s-2)(s-3)(s-4)(s-5)(s-6)$ on the interval $[-1, 7]$.

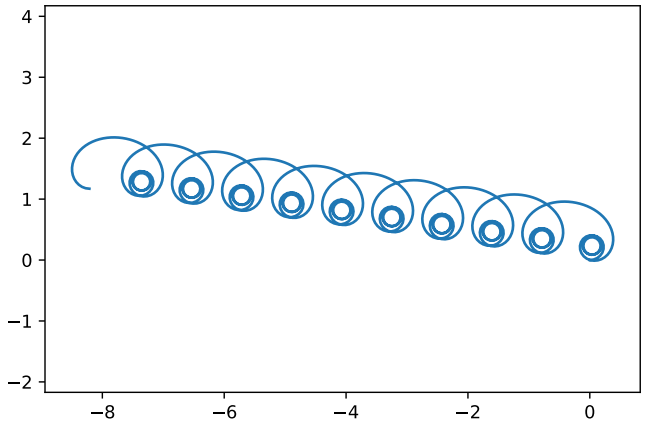

FIGURE 8. $\kappa(s) = 4 + \sin(s)$ on the interval $[0, 20\pi]$.

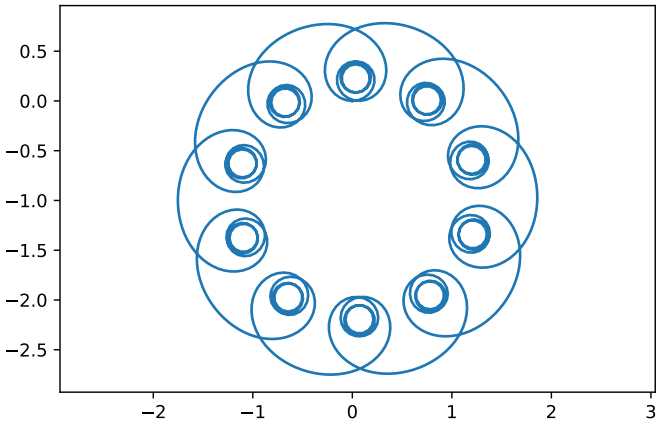

FIGURE 9. $\kappa(s) = 4.1 + \sin(s)$ on the interval $[0, 20\pi]$.