1. Do the textbook's exercise 1.1.13.

   Additionally: Figure 1.7 is not quite correct. The author forgot to specify `scaling=constrained` in Maple's plotting command. Make a proper plot of a cycloid.

2. When a circle rolls around a stationary circle without slipping, a point on the rolling circle's boundary traces an *epicycloid*. We saw in class how to derive the equation of the epicycloid and plot it, assuming implicitly that the circle rolls *outside* the stationary circle.

   If the circle rolls *inside* the stationary circle, the curve traced is called a *hypocycloid*. Derive the parametric equation of the hypocycloid when the radii of the stationary and rolling circles are a and b, respectively. Plot one or more representative cases.

3. Do the textbook's exercise 1.1.17.

4. Plot the plane curve whose (signed) curvature is $\kappa(s) = s \sin s$, where s is the arclength parameter.

   Hint: Let Let $\boldsymbol{\alpha}(s) = \left\langle x(s), y(s) \right\rangle$ be the arclength parametrization of the curve, and let $\theta(s)$ be the angle that the curve's tangent vector makes with the positive x axis. We saw in class that x, y, and θ are related through the system of ODEs

$$\begin{aligned} \frac{dx}{ds} &= \cos\theta(s), \\ \frac{dy}{ds} &= \sin\theta(s), \\ \frac{d\theta}{ds} &= \kappa(s). \end{aligned}$$

   Solve the system along with a suitable set of initial conditions, and then plot the curve $\boldsymbol{\alpha}(s)$.

   That system of ODEs has no solution in terms of elementary functions. You need to solve it numerically. See how that's done in `maple-basics-2.mw` in the course's web page.