Exercise 1
Consider the following dynamical system:

\[
\begin{align*}
\dot{x} &= y + bx, \\
\dot{y} &= -x + by - x^2y,
\end{align*}
\]

where \(x, y\) are the state variables, and \(b\) a parameter. Calculate the steady states of the system and analyze their existence as functions of \(b\). Then, vary \(b\) in the interval \([-2, 2]\) and identify the bifurcations.

Use the script symbolic.m to calculate the steady states and the eigenvalues of the Jacobian. Use the script simulation.m to simulate the system by varying the initial condition and the parameter \(b\).

Exercise 2
Consider the following discrete map:

\[x_{n+1} = r\cos(x) - 1\]

with parameter \(r \in [-5, 5]\). Simulate the map by using the script discrete.m and describe the observed behavior for different values of parameter \(r\).