

Consider the following system of ODEs:

$$\begin{cases} x' = -x - y \\ y' = x - y \end{cases}$$

- (1) Let $(x(t), y(t))$ be the solution satisfying $x(0) = 1, y(0) = 0$. Let L be the tangent line at $(x(0), y(0))$ to the trajectory of the solution. Prove that the trajectory $(x(t), y(t))$ never meets L for $t > 0$.
- (2) Prove the same statement for an arbitrary initial condition $(x(0), y(0))$.
- (3) Prove that the same holds true for any spiral sink system with any initial condition.

